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FARNBOROUGH REVIEW

FLIGHT

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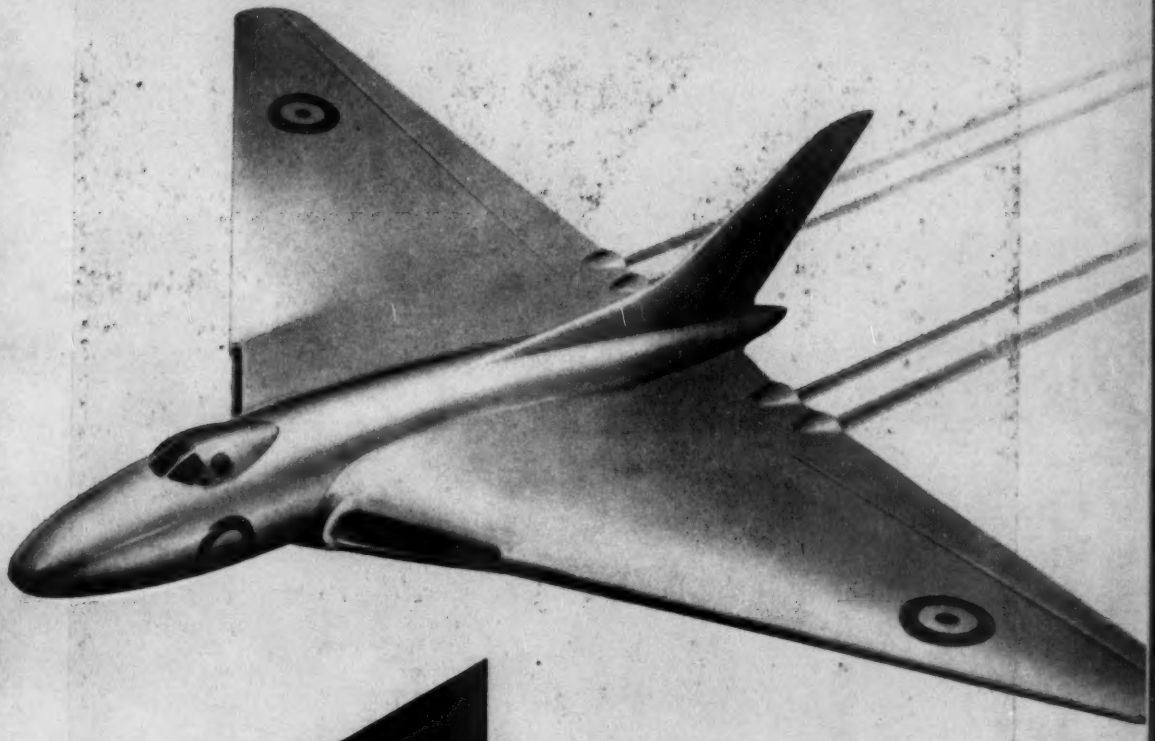

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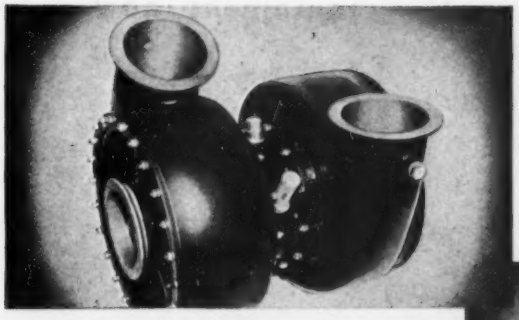

Cold Air Units

are installed in the air conditioning systems of pressurized aircraft to cool the ventilating air supplied to the cabins. Using the ventilating air as the working medium, these units are simple in operation and require little maintenance. Godfrey Cold Air Units are installed in the Comet, Viscount, Hermes, and many military aircraft.

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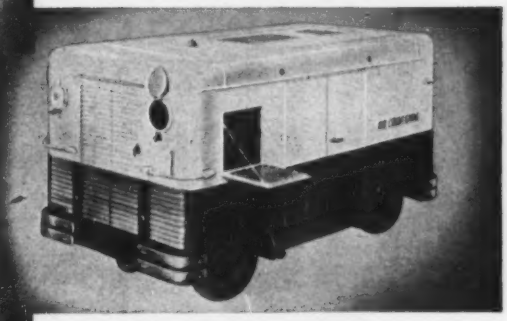

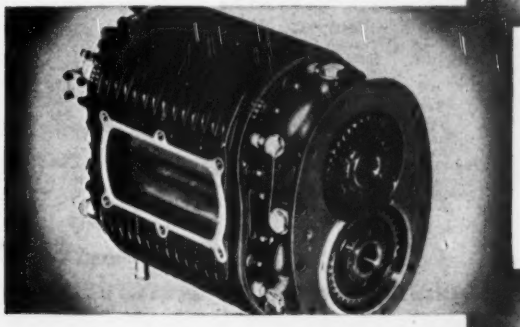

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for pressurizing and ventilating aircraft cabins. Single stage and two stage models are in production —all operating on the Roots principle. Simplicity, reliability and economy in operation are the outstanding features of these superchargers. As an example, the Type 15 supplied for the B.O.A.C. Argonaut has an overhaul life of 2400 hours, approved by the A.R.B.

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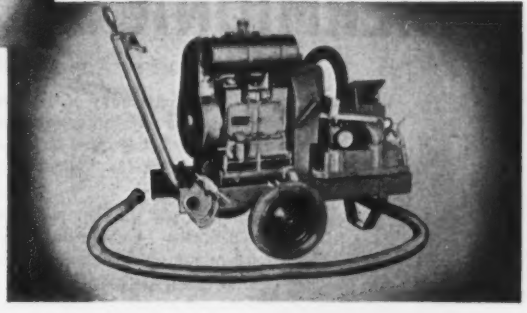

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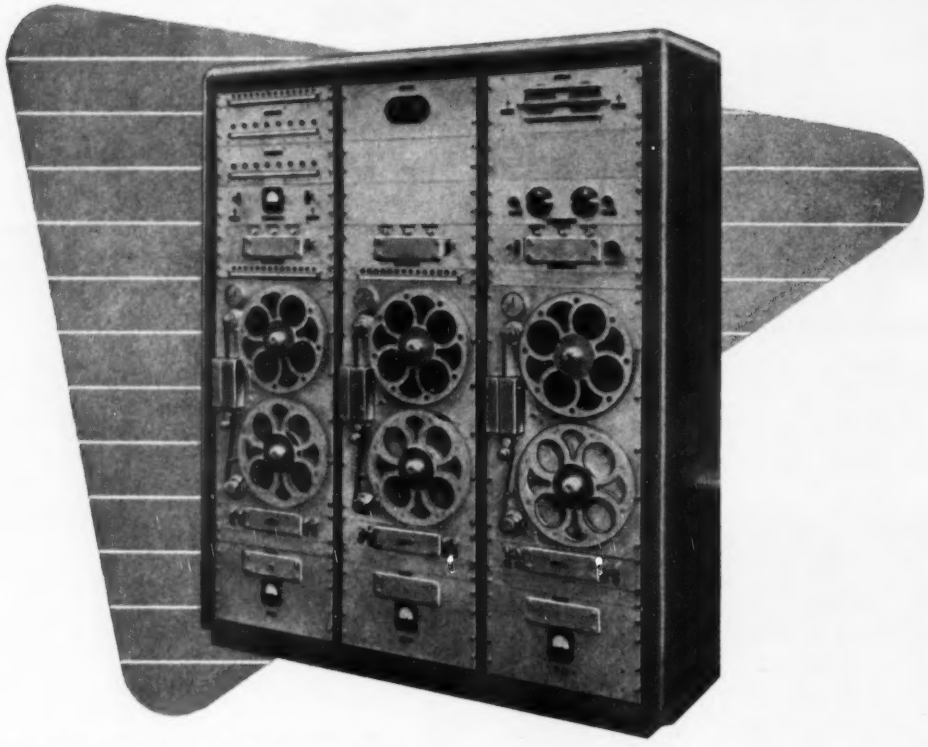

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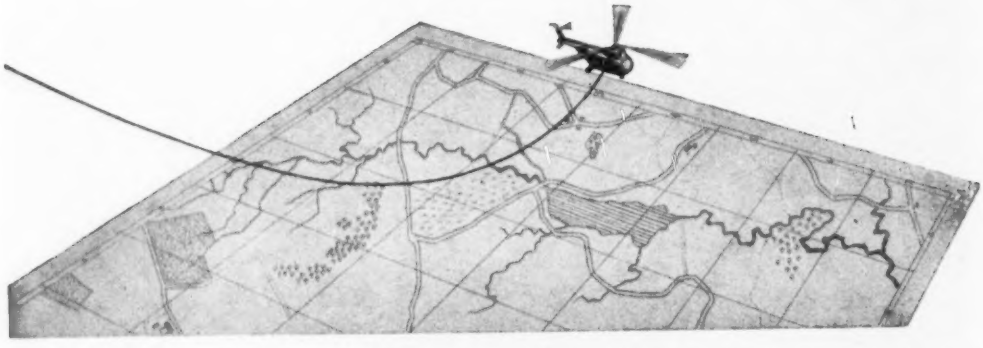

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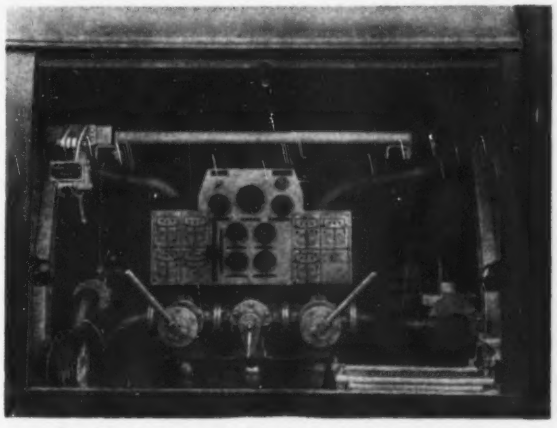
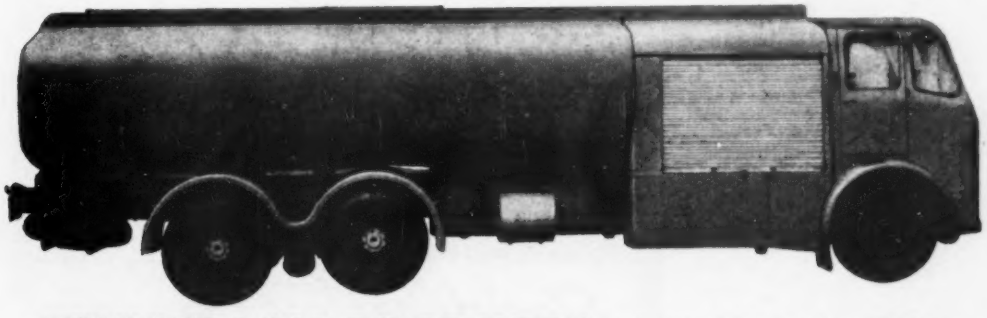


Control panel, meters and delivery hose reels of "Dorset" Fueller



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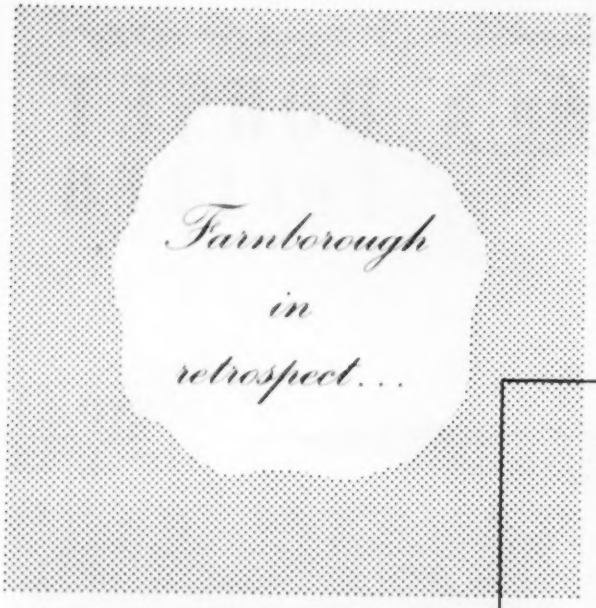

A memorable event once again . . . a pleasant series of reunions . . . and heartening confirmation of our belief that in cabin pressurising and anticing we have something which is of interest to the aircraft designer; not only in the units we make, but in the knowledge and experience we can place at his disposal. If there are any units . . . any problems . . . which you did not have an opportunity of discussing at Farnborough, we should be pleased to arrange a meeting.

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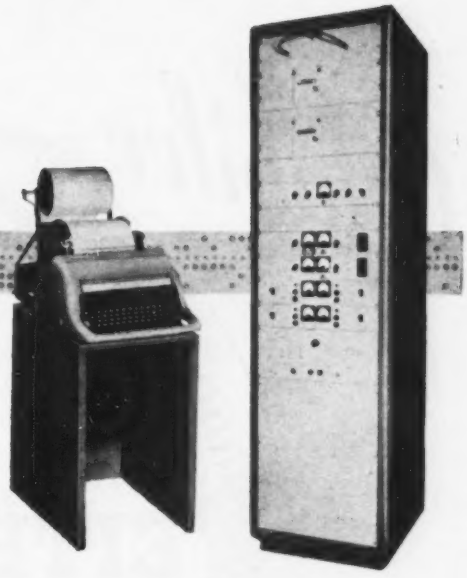
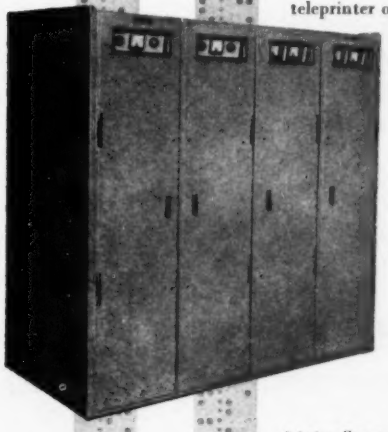


(*Above*) Typical Redifon Engineered Frequency Shift Radio Teleprinter Receiving Terminal. This particular bay incorporates: Two crystal controlled fixed frequency receivers, two frequency shift convertor units and a teleprinter.

(*Left*) Redifon G67 2 kW Twin Channel Transmitter. This is available in various forms with one to four channels. The G67 and other transmitters with power outputs ranging from 150 Watts to 7.5 Kilowatts can be supplied for radio teleprinter operation.



Increasing air traffic multiplies the volume of messages passed over aeronautical point-to-point networks. Speed of message handling also becomes a major factor with modern high speed aircraft such as the Comet. These needs can best be met by the use of Frequency Shift Radio Teleprinter Systems. Many manual circuits are now being converted to this method of operation. Redifon engineer and supply Radio Teleprinter Links for any application.

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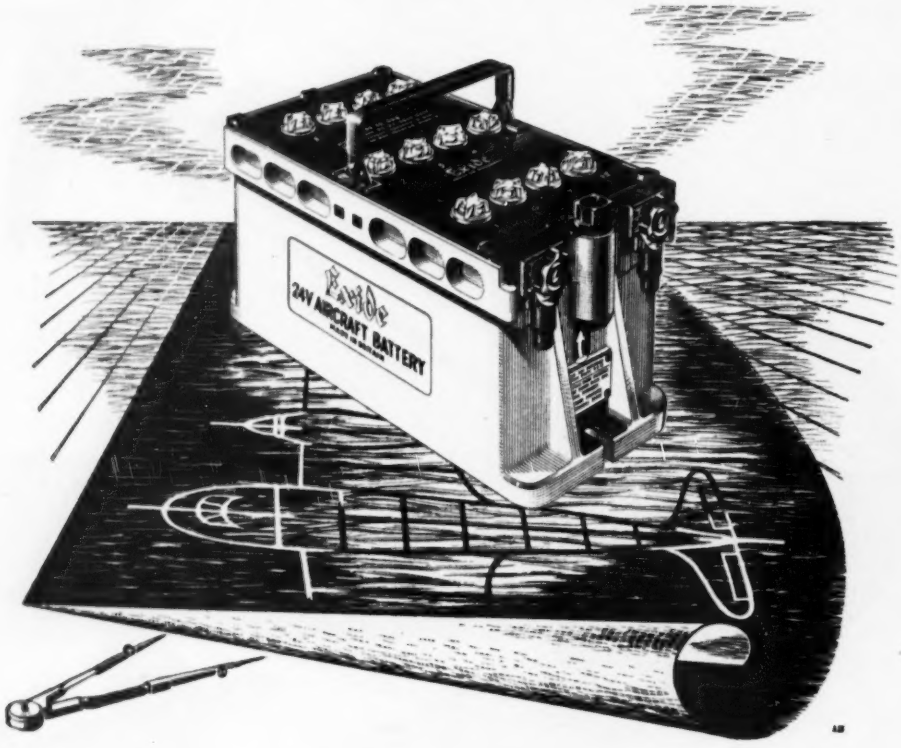

Figures of minimum battery weight for the given aircraft are modified now—by the advent of the new Exide 24V., lightest British aircraft battery for its voltage and capacity. Weight is money, in civil aircraft. Other things being equal, the lightest battery is the best. For the Exide 24V. it can be claimed that other things are better than equal. In both design and performance, this new battery steps ahead. Lightest—and best in its own right.

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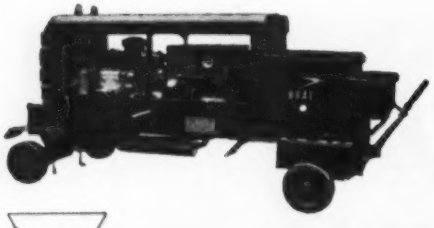

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Thus the Constellation and now the Super Constellation are playing a vital role in international commerce. They are making it possible for many nations to develop profitable airlines.

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20 Distinguished World Airlines

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On every continent of the world leading airlines fly the famous Constellation. Today more people fly over oceans and continents on the Constellations of these great airlines than on *any other modern aeroplane.* It is also the leader on the most travelled route, the North Atlantic. This successful operation by international airlines established the Constellation's record for dependable performance — leading to the development of the new Super Constellation, today's finest transport aeroplane. Altogether 20 distinguished airlines have selected the Constellation and Super Constellation. No other modern airliner has been re-ordered so often. Whenever or wherever you travel, insist on the dependable service of these airline leaders.* If there is no local office in your city, see your travel agent.

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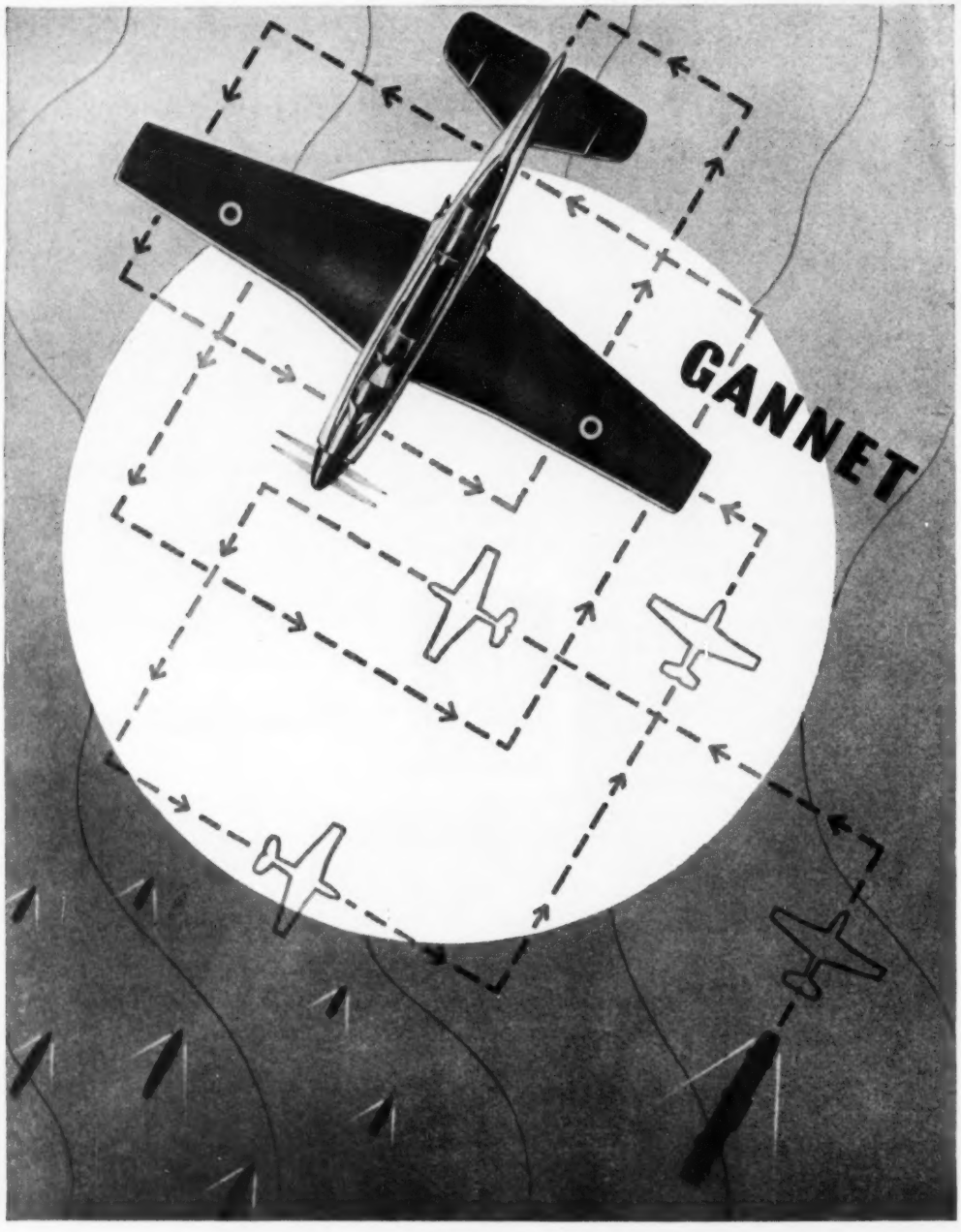

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First Aeronautical Weekly in the World

Founded 1909

No. 2277 Vol. LXII. FRIDAY, 12 SEPTEMBER 1952

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Triumph and Disaster—

FARNBOROUGH week has run its triumphal course; but it was a triumph suddenly marred by heavy loss of life under the most tragic circumstances. Seldom has the truth of the reflection that "such is the price of progress" been demonstrated with such appalling effect. Yet the triumph remains; and not only does it remain, but henceforward it will grow in magnitude as the achievement and sacrifice which have marked this Farnborough Display win their reward.

Into the grief of those stricken by loss among the spectators we make no intrusion; but of John Derry and Tony Richards, the two young men who manned the 110, it is our duty to speak. We knew John Derry as a steadfast champion of the progress which is being so perilously won. With the same resolution he sought to further the interests of his profession, and it is therefore the clear responsibility of everyone concerned to "press on"—as Derry himself remarked just before his death—giving constant thought to the pilots who render this advancement possible. And not the pilots alone, but the flight observers like young Richards, who, throughout those astonishing demonstration flights at Farnborough, continued to record the behaviour of the 110. Such men are the pathfinders of the supersonic age upon which, for better or worse, we now enter. The inquest jury's verdict—that Derry and Richards "died accidently in the normal course of their duty" must be their epitaph.

—at Farnborough

IT is not only for the supersonic fighters that this year's Display will be accounted an historic one, for in the judgment of many knowledgeable visitors, the Avro 698 represented the most significant achievement of all. These observers were impressed not only by the courageous technical concept of this great delta, but by the incredible facility with which it was handled by W/C. Falk. Many of them regretted, as do we ourselves, the necessity for fashioning it as a bomber and not for commerce, though the tremendous potential influence of all our new bombers on civil development is now apparent. Having witnessed W/C. Falk's performances, few people would not share the confidence of the Minister of Supply that, on military and economic grounds alone, the order for 698s will prove justified—though many might still dissent from the view that the delta wing form is unequalled for long-range, high-speed, high-altitude flight.

Nor was the 698 the only new delta to make an impression, for the Gloster Javelin multi-purpose heavy fighter was there, and, though subject to a temporary 400-kt speed restriction, S/L Waterton showed that its handling qualities at low and moderate speeds (and, by inference, at high altitudes) are quite exceptional.

In acknowledging the demonstrated powers of the Javelin we do not forget that this machine has not yet achieved supersonic flight, though the D.H. 110, its erstwhile competitor for Government orders, has accomplished that feat over a hundred times. It was, in fact, the two-seater 110, together with the single-seater Hawker Hunter, which served notice on the world that Britain was at last "through the barrier" with heavily armed fighters.

Though the most spectacular performances were, of course, those of the military machines, no less portentous were the first public demonstrations by the Bristol Britannia, a long-range turboprop transport of orthodox appearance, but embodying new structural advances in a degree unparalleled among machines of its class. Of uncommon beauty and singular quietness, the Britannia abounds in promise for the great commercial venture which lies ahead. For sheer magnificence, however, the Saunders-Roe Princess was supreme, and, whatever the future may hold for this incomparable craft (and hope still runs high among those who built her that she may yet accede to her rightful place over the ocean routes), her appearance sent a very special thrill of pride through those who have followed the vicissitudes of her early days.

Never, in fact, has a Farnborough Show afforded such satisfaction on the grounds of technical progress and such incentive for all concerned in its success. And though the foregoing remarks have been confined to complete aircraft, it must go on record that the power plants and—more particularly this year—certain new and wholly original items of ancillary equipment have won praise in unprecedented measure.

300,000 AT FARNBOROUGH

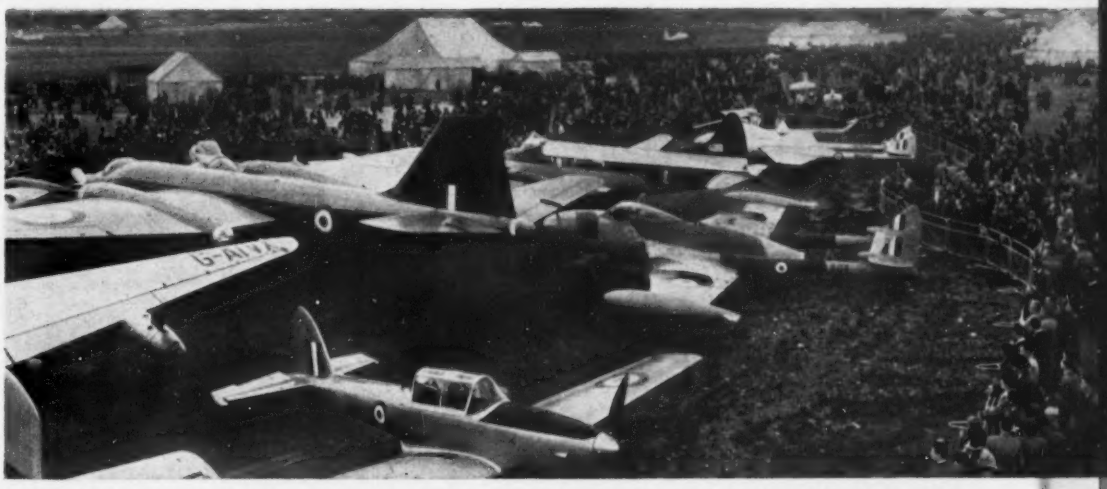
Record Attendance on S.B.A.C. Show Public Days: The Week-end Flying

NO fewer than 300,000 members of the public journeyed to Farnborough on Friday, Saturday and Sunday to witness repetitions of the magnificent flying programmes held on the four preceding days for technical visitors. On Friday there was a crowd of 40,000, and the figure was trebled the following day. Despite the tragic accident to the D.H. 110 which occurred mid-way through Saturday's programme, flying was wisely continued, and an even greater multitude of 140,000 people watched the final performances on Sunday. In the main, pilots repeated their performances of earlier in the week; the sequence and style of demonstration was as described in last week's report of the flying display. The interest of the crowds was at all times apparent, and aviation publications—of every type—can rarely have been bought in such numbers. The S.B.A.C. ordered substantially more programmes than last year, but nearly all were sold by Saturday. At times it was almost impossible to move in the static exhibition.

Low clouds greeted early arrivals on Saturday, but ceiling and visibility improved sufficiently for a normal programme to begin at 2.50 p.m. Earlier, the Bristol 171, Saro Skeeter and Westland-Sikorsky S-51 had entertained the waiting assembly with some impromptu formation-flying—one of the first occasions on which three types of British-built helicopter have flown together. The Scottish Aviation Pioneer II and Auster Aiglet joined in these low-speed proceedings. Shortly afterwards, when taking off for its part in the display proper, the Pioneer lost the use of its port elevator after striking a sodium lamp. However, with no apparent loss of control, its pilot, Mr. Smith, brought the damaged machine in for a landing from a powered approach, the damaged elevator trailing behind. Demonstrations continued without incident until about 15.50 hr, when the D.H. 110 (first prototype), having made a supersonic arrival from Hatfield, broke up while flying over the airfield. Reference is made to this accident and the loss of the pilot, John Derry, on page 344. The flying programme continued. At the time, the D.H. re-heat Venom was waiting to take-off, and it did so as soon as the runway was clear. Police and medical personnel were assisted in their work by the Bristol 171, which surveyed the areas affected by falling debris—and by the flying display itself, which held the attention of the main part of the crowd.

The unique and impromptu formation above was provided as a curtain-raiser by the Bristol 171, Skeeter and S-51 helicopters. The Wellsian form of Avro's 698 bomber (below) was seen on both public days.

The Avro 698, accompanied by the two 707s, once again made its cross-country journey from Boscombe Down—never to better effect, for the audience were rapt in admiration for the big white delta as it swept round the airfield. By the end of the afternoon the weather had improved sufficiently for Neville Duke to align visually his supersonic dive



The static park claimed its share of public attention; in the section above are glimpsed the Sealand, transatlantic Canberra, Chipmunk, Venom night fighter, Dove, Vampire trainer and civil Skeeter. (Below) Epitomizing the beauty of modern commercial aircraft: the Britannia and a series Ia Comet seen for the first time in the livery of Canadian Pacific Air Lines.

towards the airfield. Twin explosions coincided almost exactly with a fleeting glimpse of the Hunter as it pulled out overhead.

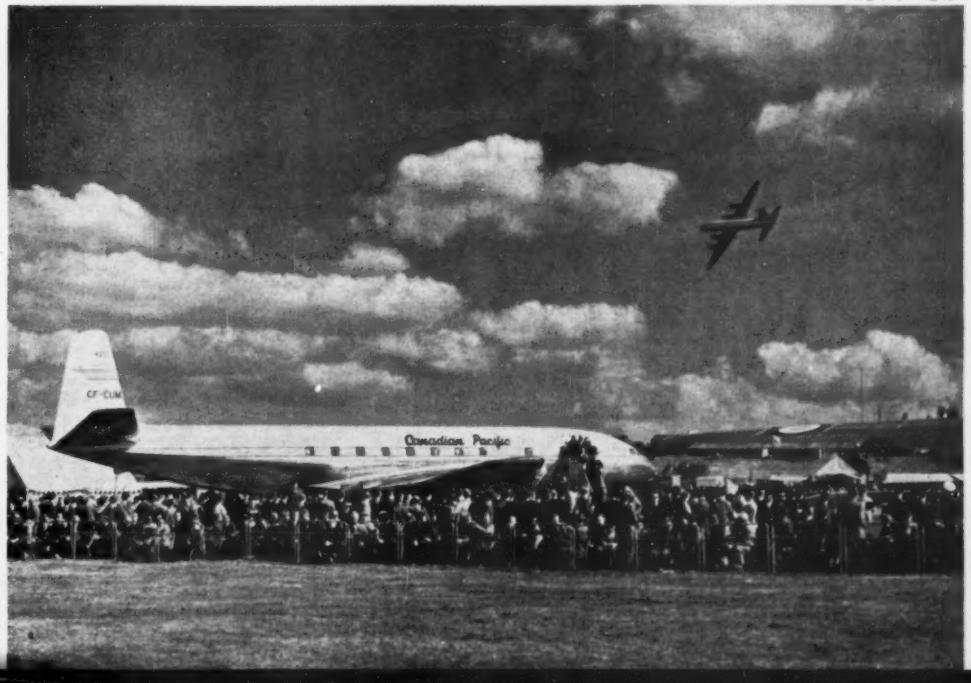
On Sunday, over 100,000 had entered the airfield by noon in spite of the depressing weather. Continuous rain had set in, and it soon became a downpour; but the aircraft were towed to their "ready" positions in case flying became possible. No change in the programme was made as a consequence of the tragic occurrence the previous day.

At about 2.45 p.m. Runciman took off the S.A./4, the four Avons sending clouds of water and steam to the rear. He reported visibility of 2 to 3 miles and a cloud-base of as high as 4,000ft; so flying was "on." But demonstrations—more particularly of the faster types—were hampered by the rain and complete overcast.

The programme was generally normal, but particular mention should be made of J. W. Squier, whose exposition of the Canberra T.4 rivalled those of W/C. Beamont; of Roly Falk, whose mighty white triangle came past closer, and faster, than ever (Falk's confidence in the Avro 698 was absolute by this time, as his vertical turn and near "aerobatting" showed); and, by no means least, to the courageous sortie of Neville Duke, who climbed to 43,000ft over Dunsfold and then dived the Hunter on a radar-monitored course, in order to provide the gathering with a "bang." He reached a higher Mach number than on any previous day of the display and was supersonic all the way down—but no bang came; those on the ground heard him pull out and shortly after, a dull boom. The 20,000ft overcast had muffled the shock-wave. But Neville followed with a rousing display at low level.

Then the familiar light-green fighter came in on the long runway, sending up the last shower of spray—and another most memorable "Farnborough" was over.

"Flight" photographs



THE FARNBOROUGH TRAGEDY

DURING the second public day of the S.B.A.C. Show at Farnborough on Saturday, September 6th, the first prototype de Havilland 110 supersonic fighter disintegrated in the air. It is with deep regret that *Flight* records the deaths of its crew of two and of 29 members of the public. A further 60 were injured—many only slightly—by parts of the aircraft. Messages of sympathy have been sent to relatives of the victims by Her Majesty the Queen and by the Minister of Supply, the Society of British Aircraft Constructors, and the de Havilland Aircraft Co., Ltd. This was the first accident—major or minor—to have occurred since the post-war revival of the annual S.B.A.C. Show in 1947.

Flown by Mr. John Derry, with Mr. A. M. Richards as observer, the aircraft was the first prototype D.H. 110 twin-Avon all-weather fighter, a silver-finished aircraft registered WG 236. Mr. Derry had flown it at Farnborough once during the preceding week, having given his other demonstrations in the black-painted second prototype, WG 240. He took off from Hatfield on Saturday afternoon and arrived over the airfield at about 3.45 p.m. after a supersonic dive. The 110 broke up in the air after making a high-speed flight low above the main runway.

A joint statement by the R.A.E. and S.B.A.C. stresses the fact that the aircraft had completed over 150 hours in the air since its first flight (made by John Cunningham) on September 26th, 1951. The two prototypes had made over 100 flights in which the speed of sound was exceeded, and there was "no *prima facie* reason for believing that the accident was associated with the supersonic flight which had preceded it."

This melancholy affair has, inevitably, received wide publicity, and several inaccurate reports have been printed. A member of the staff of *Flight* who witnessed the accident describes it as follows: "Two small white puffs of cloud appeared in a clear patch of sky north of the airfield, presumably showing where the D.H. 110 had exceeded Mach 1 in its dive. After about a minute there were two loud reports in split-second succession. The lower part of the dive must have been near-sonic, for the aircraft appeared overhead—at about 1,000-1,500ft—at almost the same instant; the supersonic 'bangs' had scarcely overtaken the 110, although they had evidently been produced at least 12 miles away. The aircraft flew out of sight to turn and line-up for a low flight above the main runway, which it made from the south-west at a speed estimated as 600-650 m.p.h. It then turned left into the circuit and flew back over the northern boundary at about 400ft. The break-up appeared to begin just before a steep 90-degree turn towards the enclosures. Small fragments came away from the 110, which gained height as the two Avons and the nose became detached from the airframe. One engine fell on a crowded slope behind the caravan parks, causing most of the casualties; the other landed harmlessly farther south. The nose, following the same path as the power-units, hit the grass just in front of a packed enclosure parallel with the runway and broke up. A number of small pieces landed on the runway itself while the airframe, minus tail-unit, nose and engines, dropped comparatively gently into the north-west corner of the airfield."

There has already been a good response to the de Havilland appeal for photographs of the aircraft at any time during its demonstration (these, readers may note, should be sent to the Director of the R.A.E., Farnborough, Hants).

John Derry was born in Cairo on December 5th, 1921, and was thus nearly 31 years old. He was educated at the Dragon School, Oxford, and at Charterhouse; at 18 years of age, in 1939, he enlisted in the R.A.F. as a wireless operator/air gunner. Flying in Coastal Command Hudsons, he was commissioned as a gunnery leader in mid-1942. In the following year he trained—in Canada—as a pilot and was subsequently seconded for a time to the A.T.A., in which he flew heavy aircraft as second pilot.

Mr. A. M. Richards.

In October 1944, he joined No. 182 Sqn., 124 Wing, flying Hawker Typhoons on close-support duties. A few weeks later, in December 1944, he was posted to 181 Sqn., and made a flight commander, and in March 1945, just before the end of the war in Europe, he became commanding officer of No. 182.

S/L. John Derry, D.F.C.

Flying with the close-support units clearing the enemy out of the low countries, Derry and his pilots did outstanding work, and on June 28th, 1945, he was awarded the D.F.C. Later, his part in the liberation of Holland was recognized by the award of the Bronze Lion of the Netherlands.

When No. 182 Sqn. was disbanded in October 1945 Derry became commanding officer of the Day Fighter Leader School at C.F.S., then flying mainly Tempest 5s. Shortly afterwards he was demobilized and went to Vickers-Supermarine as an experimental and production test pilot, remaining there until October 1947 when he joined de Havillands at Hatfield as an experimental test pilot.

He soon found himself busy with experimental flying on the third D.H. 108 swept-wing, tailless fighter (Geoffrey de Havilland had lost his life in the second prototype) and on April 12th, 1948, he used it to establish an international 100 km closed-circuit record at 605.23 m.p.h., an achievement later recognized by the award of the Segrave Memorial Trophy.

On September 6th, 1948—four years, to a day, before the Farnborough tragedy—he exceeded the speed of sound during a shallow dive in the 108. The coveted R.Ae.C. Gold Medal became his in recognition of this historical feat.

In due course the first prototype D.H.110 appeared, and Derry made the first supersonic flight in this two-seater, radar-equipped all-weather fighter on April 9th, 1952. In the meantime his skill as a demonstration and racing pilot had been proved by a number of successes, including the winning of the Coupe Montana by flying a Vampire from Paris to Cannes in 45 minutes.

Development of the D.H.110 continued successfully, and since last autumn both the first and second prototypes have made numerous supersonic fights mainly in the hands of John Derry.

More than one member of *Flight*'s staff was proud to know John Derry—a fine-looking young man and an inspiring personality—and on occasions to talk of flying and testing with him. We recall his cheerful unassuming manner, his completely straightforward and natural approach to any topic, and his firm opinions upon matters which he himself had studied and investigated. He was undoubtedly one of what we now call the new generation of test pilots, men who must be able to back their flying experience and skill as pilots with a full technical understanding.

John Derry's name first became known to the public when, soon after the war, he gave brilliant demonstrations in Vampires and usually included rapid vertical reverses of which he was one of the first, if not the first, exponent. As his experience of demonstration flying increased he was able to add touches of showmanship which led to his acclamation as a master. Readers will recall that a year ago he contributed to our columns a notable article on the finer points of display flying.

He leaves a wife—with whom the deepest sympathy will be expressed—and two young children.

A. M. ("Tony") Richards, a 25-year-old Londoner, received his technical education at Paddington Technical Institute and the de Havilland Aeronautical Technical School. He started as a trade apprentice at 17, was upgraded to engineering apprentice and was subsequently, on the strength of the ability he displayed, selected for career training on the design side of the Enterprise. He was an R.Ae.S. Graduate Member, and the last year of his four-year apprenticeship was spent mainly in the company's aerodynamics department. In December, 1948, he became a member of the flight-test section.

He was responsible for much of the airborne recording on the Heron, and a few months ago started crewing with Derry. In April last he became the first British flight-test observer to fly at supersonic speed. He was intensely keen on his work, highly capable among a team of capable men. He was an only child and was engaged to be married.

A Memorial Service for John Derry and Tony Richards will be held at St. Albans Abbey at noon on Monday September 15.

FROM ALL QUARTERS

Report on Rearmament Estimates

RECENTLY published* is the Tenth Report from the Select Committee on Estimates, for the session 1951-52. It is concerned with the rearmament programme, and, as would therefore be expected, with problems of aircraft research and production.

Of the aspects of rearmament discussed in the report, manpower, and costs and priorities are those most directly associated with the aircraft industry. The manpower situation is said to be reasonably satisfactory, with two exceptions: the call-up of apprentices and the shortage of scientific staff. The Committee recommends that apprentices should not be called up until their apprenticeship is completed, and that the creation of a Technical Reserve should be considered. The salary scales for Government scientists should be kept under constant review, bearing in mind the heavy responsibility of their work and the much higher salaries offered by the industry. The Committee state that shortages of materials and labour are progressively complicating accurate estimation of costs, as are the time-lags and modifications so often necessary. After viewing the constructional work in progress at the National Aeronautical Establishment at Bedford, the Committee were of the opinion that the lavish scale of the originally-planned scheme was no longer economically justified, and all such work should be reviewed in the light of the present financial situation.

Answering questions are men of the calibre of Sir Hew Kilner, Air Chief Marshal Sir William Dickson, Air Marshal Sir John Boothman, Professor A. A. Hall and Major G. P. Bulman, which indicates the authenticity of the information. In a memorandum entitled "The Aircraft Programme," from eight major aircraft and engine firms, the essence of their production and manpower difficulties is concisely presented, with reference to both super-priority and other work. This memorandum is a most valuable statement on this vitally important subject.

Problems of the Supersonic Age

AVIATION has received a very fair share of attention at the annual meeting of the British Association for the Advancement of Science, held last week and this week in Belfast, and attended by over 4,500 members. In addition to hearing Mr. Knowler's lecture (summarized on pages 349-352 of this issue) members of the Engineering Section joined the Physiology Section at a joint meeting to hear some important discussions of the problems raised by the fact that the demands imposed by scientific development are now outstripping the ability of the human mind and body to meet them. High-speed and high-altitude flying have emphasized these problems, and were the subjects of contributions.

. G/C. W. K. Stewart, of the Institute of Aviation Medicine, said that collaboration between the physiologist and the engineer had paid dividends, and it would be even more important in the future. The modern high-performance military aircraft in every aspect could impose stresses vastly greater than the powers of adaptation of the human body. Indeed, it would soon be essential to solve physiological problems before design problems.

By way of example, he went on to explain the difficulties raised by the high g-loadings. A pilot accustomed to high-speed flying could withstand 30g, but the modern aircraft was able to impose a higher figure than that. The man could be taught to counteract some of the effects by his own physical efforts, while special clothing was also a help. His position in the aircraft was important, and it has been found that sitting in a "folded up" attitude, with the extremities of the body as close to the heart as possible, was useful. Eventually, however, adoption of the prone piloting position might be necessary.

"Aviation deafness," as suffered by aircrews, was one of the points of interest discussed by Dr. K. G. Bergin, medical superintendent of B.E.A. He said it was a progressive condition brought about by the continual bombardment of the ear by noise. Deterioration began in the higher frequencies on a gradually descending scale, and the first symptom noticed was an inability to distinguish consonants and sounds of high pitch. A clear association existed between the number of hours flown, age, and a decrease in auditory acuity. The condition could not be cured, but its onset was prevented or greatly minimized by the proper noise-insulation of fuselages or the provision of suitable ear protectors.

The designer's viewpoint was explained by Mr. D. G. A. Rendell of the R.A.E. Of cabin air-conditioning, he remarked that in transatlantic flying the controlled atmosphere was "nearly always too cold for American and too hot for the British."

Mr. Rendell surprised some of his audience by the statement that noise levels in turbine-powered aircraft differed little from those in piston-engined types, but went on to explain that it was the absence of vibration that provided the greater comfort. Of still faster flying, he said that when the speed of sound was exceeded "the noise due to the whole aircraft rushing through the air probably becomes of more relative importance than all the rest of the noise put together."

Among the presidential addresses read on September 5th was one by Sir Ben Lockspeiser, F.R.S., entitled "Progress in Aeronautical Science and Engineering." He expressed a fear that aircraft were tending to surrender much of their great mobility by becoming tied to expensive airfields. The helicopter alone had learnt to operate from a confined space; but this type of aircraft was for long an unwanted child in a family expensively brought up on speed.

It might be that "in the not very distant future" folded and faired-in powered rotors might be employed on fixed-wing aircraft for use during take-off and landing; these rotors would not prejudice maximum speed and it might be that, by removing the restraining influence of landing speed on top speed, such an arrangement might actually permit higher speeds to be attained. If that were so, the greatest gain would lie in the realization of safer, and far more economic, landing and take-off conditions.

Sir Ben felt that, if aircraft were to become yet faster and heavier, the main economic problem was to be found less in the air than on the ground. The need for very heavy runways had led to two very interesting developments: pre-stressed concrete, and the use of water-bags. The second method was due to Williams of the R.A.E., who proposed to lay a concrete-slab runway on large, flexible bags filled with water. These bags would not have to resist any significant stress, but would spread the high aircraft tyre-loading over a much greater area of subsoil. An even more radical idea was being worked upon by Green and Thompson, also of the R.A.E., who had devised a means of catapulting aircraft into the air and landing them—without an undercarriage—on a stretched flexible sheet. This arrangement required some strengthening of the aircraft belly, but the weight penalty was slight compared with the saving made by the elimination of the undercarriage.

A Brief Note on Bangs

THE S.B.A.C. Flying Display has brought an advanced aerodynamic phenomenon into the everyday discussions of large numbers of people. While little is yet known about certain features of the "bangs" produced by supersonic flying, the following remarks are offered for guidance until a more complete exposition can be published.

All supersonic bodies produce shock-waves. These waves represent the boundary between two dissimilar types of airflow; on the leading edge of a wing, for example, the air in front of the shock-wave is moving with supersonic velocity (relative to the wing) and has local atmospheric pressure. Immediately behind the wave the flow will be reduced in velocity and will have higher pressure. The reverse will be true of expansion shock-waves which will occur farther aft on the wing surface.

In the vicinity of a supersonic wing the wave must clearly have the same velocity through the surrounding air as the wing, and is thus not analogous to a sound wave. Farther from the wing, compression is less intense and the wave becomes a normal sound-wave; the wave-front will thus bend back across the wing until it has an inclination the sine of which is equal to the reciprocal of the Mach number. This inclined wave-front will then proceed indefinitely and will eventually strike the ground.

A shock-wave will, therefore, move through the air faster than sound when it is immediately associated with a supersonic body. But it cannot have a velocity lower than that of sound and, if the source decelerates (an aircraft at the bottom of a dive, perhaps), the wave-front will leave the aircraft behind and continue on in the flight-path which was followed as the aircraft became subsonic. The ground observer in the flight path will then hear a bang as the shock-wave passes him.

The intensity will vary according to the observer's distance from the flight-path and according to the type of wave concerned. A weak Mach compression wave from the nose of a sharp-edged aerofoil will probably be heard first; this will be followed by a stronger wave from the expansion wave over the wing, and may be rounded off with one or more bangs from the tailplane. The attenuation is bound to be considerable and the source of the wave detachment will have to be below about 20,000ft for a bang to be noticeable. The pressure difference across the wave is not great and the sound energy is low; it is, therefore, surprising that windows should be broken, for this implies considerable mass air-movement. The effect of cloud is a further complicating factor.

*Her Majesty's Stationery Office. Price 6s

OVER-THE-BORDER INTEREST: The Assistant Secretary of the U.S.A.F., Mr. Roswell L. Gilpatric, and the Deputy Chief of Materiel, Lt.-Gen. Orvall Cook, recently visited Malton Airport, Ontario, and saw the Avro Canada CF-100 and de Havilland Otter and Beaver put through their paces. In this group are, left to right, S/L. Jan Zurakowski (of "Zurabetic" fame), who flew the CF-100; Mr. Gilpatric; Mr. Crawford Gordon, Jr., Avro Canada's president; and Lt.-Gen. Cook. Among executives who received the two distinguished visitors was Mr. Russ Bannock, director of military sales for de Havilland Canada.

FROM ALL QUARTERS . . .

Helicopter Association Lecture

THE opening lecture of the Helicopter Association for the 1952-53 season was given on Friday last at the Institution of Civil Engineers, and preceded the Association's dinner in Londonderry House. The subject of the paper was "Helicopter Operating Experiences" and the lecturer was M. A. V. J. Vernieuwe, vice-president and head of the Department of Operations of Sabena. In the chair was Mr. P. G. Masefield.

M. Vernieuwe gave first a résumé of Sabena's past helicopter experience. Although some anti-malaria spraying by helicopter had been carried out in the Belgian Congo, the company's main operations had been the scheduled internal mail service from Brussels. A five-year agreement with the Post Office had been signed two years ago, the route flown being Brussels-Libramont-Liége-Tongres-Hasselt-Beeringen-Turnhout-Herenthals-Anvers-Brussels, a circuit of 271 miles total length.

The regularity of the service had been good, except during the winter of the first year. The annual average percentage regularity for the circuit had improved from 91.2 in the first year to 97.1 in the second, and that for individual stops had improved from 86.0 to 95.1. V.H.F. contact was maintained during flight, and V.H.F./D.F. bearings were available all along the route. The average block speeds made good were 70 m.p.h. (summer) and 65 m.p.h. (winter). The Post Office had expressed satisfaction with the mail flights, and another route, a closed circuit of 197 miles, to the west of Brussels, was to be opened on September 15th.

The heliports (or rotorstations) used had been of simple type, situated near the respective post offices, the essential feature being clear approach paths. Projected heliports were one, 75 metres by 24 metres and stressed to 25 tons, on top of the seven-floor post office building in Brussels, and another, for passenger services, on top of the Sabena building.

Bell 47D1 helicopters had been used for the work, and a daily utilization of 2 hr 1 min had been achieved. It had been found that helicopter flying was more fatiguing for the pilot than flying fixed-wing aircraft. A considerable amount of blind-flying practice had been carried out, and an instrument-flying permit for the machines was being sought. The operating costs of the helicopters were high, amounting to 7s per mile in the first year of operation, or equivalent to those of a DC-4 carrying seven tons of payload!

In the second part of his lecture, M. Vernieuwe discussed Sabena's future policy on various aspects of helicopter operation. Questions such as a distinctive radio identification sign for helicopters, the size and strength of helicopter-supporting platforms and the integration of helicopters into the general system of airways and control areas were among those needing international agreement.

M.o.S. (Air) Reorganization

CHANGES in the organization of the aircraft-development side of the Ministry of Supply, and appointments and re-appointments in connection with them, were announced last week.

Mr. A. W. Woodward-Nutt has been appointed Principal Director, Research and Development (Aircraft). He is to supervise and coordinate the work of the following four directorates: Military Aircraft Research and Development (R.A.F.), of which A. Cdre. G. Silyn Roberts has been appointed Director; Military Aircraft Research and Development (R.N.), the Director of which will be Captain (E) C. W. Jones, R.N.; Civil Aircraft Research and Development, which remains under Mr. J. M. Gray; and Aircraft Servicing Research and Development, of which A. Cdre. W. A. Opie is to succeed A. Cdre. G. B. M. Rhind as Director.

The establishment of two distinct directorates dealing respectively with R.A.F. and R.N. aircraft is a logical one in view of the increasingly specialized requirements of the Navy. The two departments take over the work of the former Directorate of Military Aircraft Research and Development.

Internationally Instructive

AIR, military, and naval attachés and/or assistant attachés of 10 different countries recently toured the aircraft and training divisions of Air Service Training, Ltd., at Hamble. The visit was one of those organized monthly by the Directorate of Allied and Foreign Liaison, Air Ministry, to factories and similar establishments of technical interest.

The visitors were Brig. Maj. R. P. Olmedo (Argentina), Col. Ba-Shin and F/L. Aung Din (Burma), Cmdt. M. Errazuriz (Chile), Capt. Plt. A. A. Albizu (Dominica), Capt. S. Cheibani (Iran), Col. K. P. Salmon and Maj. M. Sharon (Israel), Capt. S. F. Bissmark (Sweden), Lt-Col. P. Gygli (Switzerland), Maj. W. Winneshiek (U.S.A.), and Lt-Col. M. De La Rosa (Venezuela). In charge of the party were W/C. D. S. Wilson MacDonald and W/C. P. R. Thomas from the Air Ministry.

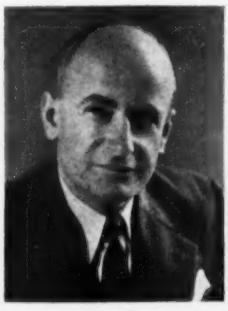
The visitors were welcomed and conducted round A.S.T. by Air Marshal Sir Hugh Walmsley (managing director), W/C. A. H. Abbott (chief instructor), and other executives. Among the activities which they saw in the works were the production of both major assemblies and details for Meteors, and—in the development shop—the installation of an Atar turbojet in a Meteor for France. During their tour of the training division they learned that civilian students at present under instruction at Hamble, numbering nearly 200, are from no fewer than 31 different countries.

Rolls-Royce Senior Appointments

FROM Rolls-Royce, Ltd., comes the announcement that Mr. J. D. Pearson, Wh.S.Sc., B.Sc., Eng. (Lon.), M.Inst.Mech.Eng., A.F.R.Ae.S., M.I.Prod.E., has been appointed chief executive of the company's Aero Division.

Mr. Pearson joined the organization in 1933. At the end of the war he was posted to Canada, where he established, in Montreal, a Rolls-Royce technical office that has since become a subsidiary company—Rolls-Royce of Canada, Ltd. On his return to England he was appointed chief service and quality engineer and later became general sales and service manager. He was appointed a director of the company in 1949 and general manager of the Aero Division in 1950.

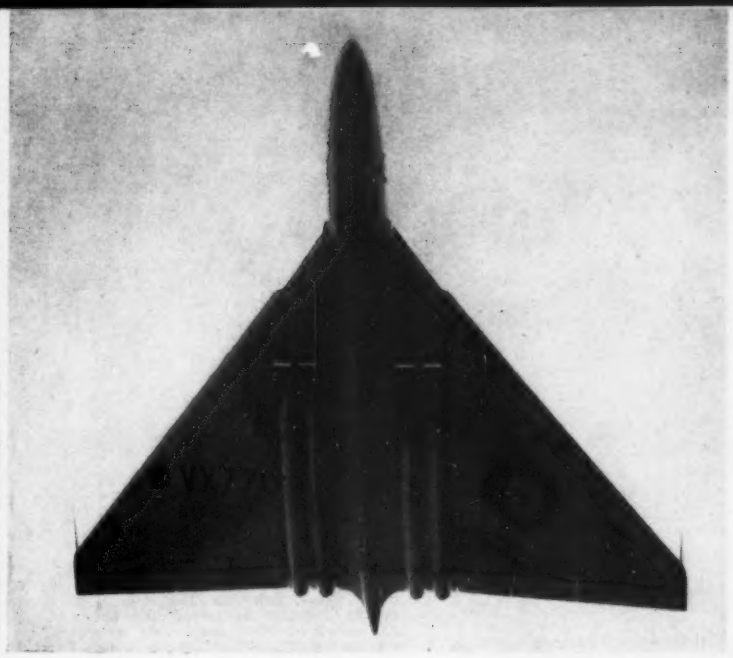
Mr. A. F. Kelley, B.Sc., A.M.Inst.C.E., A.M.Inst.Mech.E., M.I.P.E., who became an assistant general manager (Aero Division) in 1950, has now been appointed general manager (manufacturing) of this division.



Mr. J. D. Pearson

Mr. A. F. Kelley

His association with Rolls-Royce, Ltd., began in 1939, when the company he was with at that time were called upon by the Derby firm to advise on the design, layout and organization of the new Glasgow factory. Mr. Kelley was assigned to this task and in 1940 was seconded to Glasgow to assist executively in bringing the works into production. He became assistant works manager there in 1940 and continued in this position until the end of the war, when he returned to his consulting firm. There he served as chief engineer from 1946 until 1949, when he relinquished the appointment to join Rolls-Royce.



GIANT RAY: This most revealing study of the Avro 698 bomber, lately ordered into production for R.A.F. re-equipment, shows the proportions and disposition of the control surfaces, the necessarily long tail pipes for the four Rolls-Royce Avons, the air-brakes and the stowage of the bogie main-undercarriage units outboard of the turbojets.

"Flight" photograph

HERE AND THERE

Swift Record Confirmed

THE London-Brussels flight made by D. W. Morgan in the Vickers Armstrongs Supermarine Swift (Rolls-Royce Avon) on July 10th is now confirmed by the F.A.I. as a point-to-point record. The time was 18 min 3.3 sec, an average speed of 1,071.648 km/hr (665.89 m.p.h.).

Avon Tributary

THE new Rolls-Royce factory at East Kilbride, near Glasgow, started production of Avon components last week. It is reported that assembly of complete engines will begin within the next five months.

Fairchild-Fokker Link

FOLLOWING the Fairchild - Fokker agreement (reported in *Flight* of August 1st) on the building of Fokker S.14 turbojet training aircraft under licence by the American company, a farther and more comprehensive agreement is announced. Fairchild are to handle the U.S.A. sales organization for all current Fokker aircraft, and have the option on the American manufacturing rights. In return, the rights of sale, repair and service of Fairchild products in Europe are transferred "as far as practicable" to the Dutch firm.

Anti-Submarine Lincolns

LINCOLNS now being modified in Melbourne to take modern radar equipment will shortly be used by the R.A.A.F. on anti-submarine patrol training off the Queensland coast. The nose of each aircraft is being lengthened to take the installation and the first re-equipped machine has already been flight-tested. It is stated that the Lincolns will continue to be used off the Queensland coast, while those on patrol off Western Australia will be replaced by Neptunes. Australian crews at the Lockheed factory at Burbank are due to fly three more Neptunes to Australia this month.

No More Free Rides

FROM October 1st passengers are to be charged for coach travel between city terminals and airports throughout Europe and America. Such charges have been the practice in North America for many years, but the I.A.T.A. decision to introduce them elsewhere is likely to prove unpopular in many quarters. The fare for single journeys between London terminals and Northolt or London Airport will be 5s.

A.O.P. Candidate?

AN R.A.F. pilot flying between Thirsk and Northallerton early one morning last week noticed that a van of the York-Newcastle night parcels express was on fire. He advised his airfield by R/T., with the result that fire engines met the train at its next stop and dealt with the blaze.

Hiller Ramjets Ordered

THE American Defence Department has announced that five Hiller Hornet two-seat ramjet-driven helicopters have been ordered by the armed services for evaluation tests. Two each are destined for the Army and the Navy and one for the Marine Corps.

Softening the Jab

OF importance to those about to travel to the East and other areas in which immunization is necessary is the Ministry of Health announcement that new and simpler forms of certificates of vaccination against smallpox and cholera come into effect on October 1st. Travel agencies, etc., will receive the necessary instructions.

To Encourage Young Eire

A CHEETAH engine from a Consul has been presented by Aer Lingus to a technical school in Dublin, under its policy of giving such schools surplus equipment in order to encourage aviation education. A two-year aeronautical course is being started at Limerick Technical Institute, limited to 25 students, 12 of whom are Aer Lingus employees.

New R.N. Air Station

ON September 4th, H.M.S. *Goldcrest*, the R.N. Air Station at Brawdy, near Haverfordwest, Pembrokeshire, was commissioned with Capt. R. E. N. Kearney,

SKY SIGN: This Auster V, about to go to a purchaser in Singapore, has been wired for neon-tube advertising under the wings. For a little under £500 above the normal price of the aircraft, Austers can install the necessary electrical equipment, which includes racks and connections to take the ordinary neon-tube letters available from companies specializing in this form of publicity.

HERE AND THERE . . .

O.B.E., R.N., in command. Brawdy Airfield was built for the R.A.F. during the war and was subsequently handed over to the Royal Navy, who have since kept it in reserve on a "care and maintenance" basis. It is now to be an armament training station for day and night fighter squadrons.

Bréguet 960 for R.A.E.?

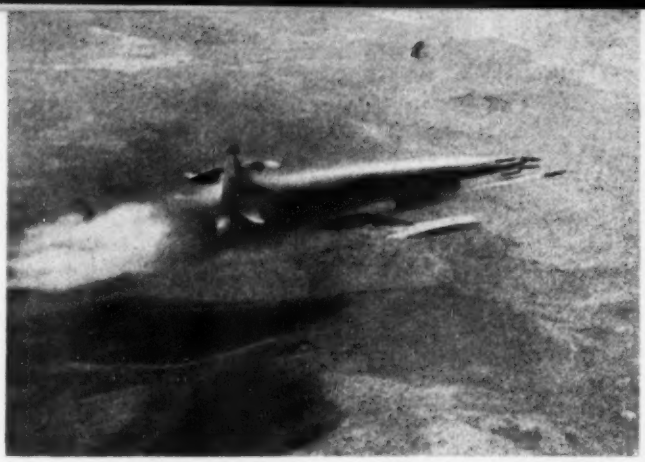
THE second prototype of the Bréguet 960 carrier-borne strike aircraft, powered with a Rolls-Royce Nene turbojet and an Armstrong Siddeley Mamba 3 turboprop, is now complete. Dummy deck-landing tests are likely to take place at the Royal Aircraft Establishment, Farnborough.

Machine Tools on Show

THE International Machine Tool Exhibition, to be held at Olympia, London, from September 17th to October 4th, will be open to the public daily (Sundays excepted) from 9.30 a.m. to 6.00 p.m.; admission is 3s 6d. The exhibition is organized by the Machine Tool Trades Association.

Battle of Britain Week

LAST week we gave details of next Monday's (September 15th) Battle of Britain fly-past, and the principal facts are repeated here as a reminder to Londoners and those in the Home Counties over which the formations will pass. The usual lone Hurricane leading the fly-past is due over Whitehall at 12.30 p.m. precisely, and it will be followed by 212 other aircraft of the R.A.F., R.C.A.F., R.N., and—by invitation—the U.S.A.F. Nearly 200 of the participating aircraft will be jets. On the following Saturday, September 20th, 76 R.A.F. stations will be open to the public, and at most of them flying displays and static exhibitions will be organized. Admission will be free, but proceeds from car parking and programme sales will go to Service charities. Next day, Sunday, Battle of Britain thanksgiving services will be held in Westminster Abbey and in many cathedrals and churches throughout the country.



KNOCKOUT DROPS for bombers, in the form of twenty-four 2.75in Mighty Mouse rockets, are discharged in salvo by a Lockheed F-94C Starfire. An official caption makes reference to a "huge flameball" which spurts from the nose, and to smoke plumes which stream rearward, almost enshrouding the aircraft.

During the coming week, R.A.F. aircraft will be on view on Horseguards Parade, London, and, on September 20th to 21st, at London Airport.

R.A.F. Arctic Research

ARIES III, the specially equipped Avro Lincoln of the R.A.F. Flying College, left its base on September 5th to carry out a detailed survey of flying conditions around the North Pole. The crew was captained by S/L. J. T. Lawrence and included W/C. S. B. Grant and Lieut-Col. E. A. Butts, U.S.A.F., and S/L. W. E. Hassan, the college medical officer. Also on board was Dr. G. C. L. Bertram, director of the Scott Polar Research Institute and a tutor of St. John's, Cambridge. *Aries III* was held up on the outward journey by a leaking fuel tank at Keflavik, Iceland, and again at a Greenland base on Saturday with engine trouble. The planned schedule required a non-stop return flight to Manby from Whitehorse, Yukon, a distance of 4,174 miles by great-circle route.

Second Plastics Exhibition

FOLLOWING the success of the first British Plastics Exhibition, held in 1951, over 82 per cent of the space available for the second exhibition has already been applied for. Organized by the Iliffe journal *British Plastics*, it is to be held at Olympia from June 3rd to 13th, 1953.

Heinkel to the Rescue?

BRITAIN'S aircraft industry shows "a certain lack of energy and production capacity," according to Prof. Ernst Heinkel, speaking to newspapermen in Germany on his return from Farnborough. "She has many orders for the magnificent Comet jet airliner, but her delivery times are too long. That is where I would like to step in with my organization and my workers." The Herr Professor also thinks "it is nonsense for five Western States to design ten types of aircraft to oppose the standardized production of the Soviet bloc." There are now four Heinkel factories in operation in Western Germany, making machine-tools and insecticide-distributing machines.

IN BRIEF

IT is announced that Mr. K. W. Stephens, M.C., commercial manager, and Mr. K. M. Johnson, works manager, have been co-opted to the board of Wallington Weston and Co., Ltd. (incorporating Frome Plastics, Ltd.).

* * *

Mr P. G. Hering has recently resigned from the editorship of the *R.A.F. Review*.

* * *

Among many informal functions held during the S.B.A.C. Display period was a dinner given by Bryans Aeroquipment, Ltd., to their overseas agents from 16 nations. Speeches were made by Mr. Stephen J. Gordon (chairman) and Mr. J. R. Bryans (managing director) and responses were given by Mr. A. Duguid (Canada), Dr. A. Jona (Italy) and Mr. G. C. Dalman (Holland).

* * *

The appointment is announced of Mr. Roy C. Orford, M.Sc., C.P.A., A.M.I.E.E., as patents manager to Power Jets (Research and Development), Ltd. After the war, in which he first worked in the transmission department of G.E.C., Coventry, and later served in the R.N.V.R. as an air electrical officer, Mr. Orford became a development engineer with Waymouth Gauges and Instruments, Ltd., and in 1947 joined the Patent Department of Standard Telephones and Cables. He joined Power Jets in March last year.

* * *

The affairs of Cunliffe-Owen Aircraft, Ltd., Southampton, pre-war designers of a "flying wing" transport based on Burnelli patents, are to be finally wound up at a meeting of creditors in London on September 18th.

* * *

David Fletcher, a Saunders-Roe apprentice, has been awarded an S.B.A.C. Scholarship to the College of Aeronautics, Cranfield. He obtained his Higher National Certificate in 1951, has since taken an advanced course at Southampton University, and is at present in the Saunders-Roe Design Department.

* * *

Under the heading "Propeller Denial," the London *Daily Telegraph* published the following paragraph on September 5th:—"De Havilland Propellers, Ltd., point out that the statement by Air Cmdre. L. G. S. Payne in *The Daily Telegraph* of Aug. 27 to the effect that in August, 1951, the propeller of a B.O.A.C. Hermes aircraft broke in the air over St. Hilaire, in Central France, is inaccurate. De Havilland Propellers, Ltd., state that that accident was in no way caused by any failure of a propeller, and no inference can therefore be drawn that the accident to another Hermes aircraft off Sicily on Monday, Aug. 25, 1952, might be attributable to a propeller failure."

* * *

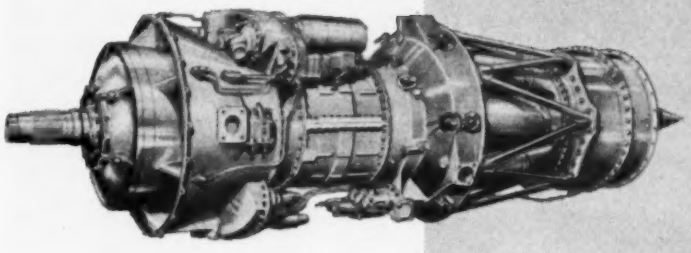
Speaking at the annual general meeting of E. K. Cole, Ltd., the chairman, Mr. E. K. Cole, made reference to the simplified airfield-approach system recently developed by the company; he said that a number of installations were now being manufactured for the Ministry of Supply, and it was hoped that substantial orders would be received for home and overseas markets.

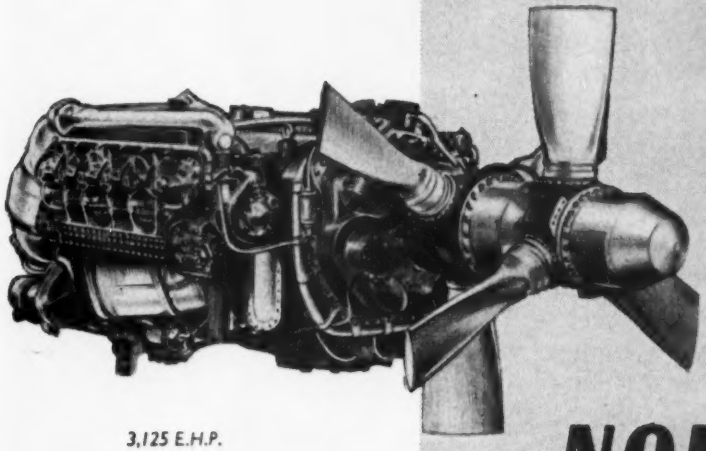
* * *

The Cheshire Engineering Co., Ltd., announce that a subsidiary company, Webslight, Ltd., Alliance House, Caxton Street, London, S.W.1, has been formed for the manufacture of Webslight reflecting and non-reflecting road and vehicle signs. Mr. F. W. Hunt has been appointed managing director. Webslight signs were first demonstrated to the Royal Society for the Prevention of Accidents, the Air Ministry, the War Office and the Ministry of Transport in May last.

ELAND

3,000 E.H.P





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THE MARINE AIRLINER

—and its Future Development: Mr. H. Knowler's Lecture to the British Association

An artist's impression of the type of marine airliner visualized by the lecturer. The position of the turbojet power-plants is unique.

IT will be remembered that, for his Bleriot Lecture earlier this year, Mr. Henry Knowler, A.M.I.C.E., F.R.Ae.S., chief designer of Saunders-Roe, Ltd., chose as his subject "The Future of the Flying-boat." He has now written a second paper on a similar theme entitled "Future Development of the Flying Boat Airliner." It was due to be read by Mr. Knowler before the Engineering Section of the Belfast meeting of the British Association on Monday last, September 8th; an abstract of the paper follows.

THE outstanding example at the present time of a high-speed airliner is the de Havilland Comet. Its performance [said the lecturer] gives an indication of the speed which will be demanded in the future, but, because of the high fuel consumption associated with a jet engine, it is not yet able to cover, in direct flight, the maximum stages necessary for global travel; in fact, there is no airliner in existence to fulfil this requirement. An early solution to the latter problem is exemplified by the Princess flying-boat where, by the use of propeller turbine engines—operating at their most efficient altitude—and with a sufficiently large aircraft, it has been found possible to design a machine capable of covering the longest stages at present envisaged. However, it is the intention, in this Paper, to look further into the future and to predict the direction in which development is likely to proceed.

One notices development trends in three directions, two of which have already been mentioned. These are: a very much higher speed of travel, the second, greatly increased range, and the third trend, which appears to be very definite at this time, is towards improved passenger comfort.

There is no difficulty in establishing the necessity for high-speed travel; it is sufficient, therefore, to decide the maximum speed which can be achieved economically. Drag increase due to compressibility will set the limit, and the maximum cruising Mach number will be decided by the action that can be taken to delay the onset of compressibility effects. This speed appears to be limited to a Mach number in the neighbourhood of 0.8 to 0.85 and, for the reasons stated later, a figure of 0.83 has been assumed, giving a cruising speed of 550 m.p.h. Speeds as high as this can only be achieved economically in the stratosphere.

The desirability of direct flight over long stages has already been mentioned. For example, the use of a high-speed aircraft, combined with one or more refuelling stops at present necessary on the Atlantic crossing, reduces the overall mean speed of the fastest aircraft to a somewhat pedestrian value, and it is clear that not only must speed be high but the range potential must also be adequate to ensure direct flight. Hence, the problem before us has now been crystallized into the design necessary to make flight possible at $M = 0.83$, with a present limitation in altitude to 40,000ft, for stage distances representative of global travel. There are, however, a number of other factors which will have an important influence on the configuration of the machine, many of which are associated with passenger comfort.

First it is necessary to assess the payload capacity which is to be carried to meet operators' requirements. This factor is critical to the design, since the greater the capacity the bigger the relative body size—resulting in higher drag and structure weight.

Examination of the statistics of transatlantic travel over the last few years indicates a steady annual rise in the number of passengers carried, with a potential increase of 60,000 passengers per annum divided equally between the two modes of transport. At this rate of increase, in six years twice the number of passengers will travel by air relative to those now carried, without counting on transfer from surface to air travel. This will create problems at the already congested airports which can only be solved by duplicating airports, by increasing the size of aircraft, or both.

A statistical examination of present practice shows that for long journeys, such as the staged transatlantic flight, the seating capacity per aircraft is from 40 to 60, each seat requiring about 2,500 lb of aircraft weight. At the present time, practically all airlines are introducing coach seating on a number of their scheduled flights. This involves a deterioration in passenger comfort, but it is considered this can only be a temporary expedient. It is assumed that the general trend in comfort improvement will continue; consequently, greater volume must be provided and, in accepting this condition, an increase in relative body drag must be faced.

Firstly, it is desirable to review the improvements which can be made arising from the latest hydrodynamic research. In the past, the air drag of flying boats relative to landplanes has been high. In recent years the primary aim of development has been to reduce or eliminate this drag difference so that flying-boats can compete on equal terms with the corresponding landplanes. Analysis of the factors contributing to flying-boat hull drag compared with a streamline body shows that by far the greatest drag has been due to the main step, other items such as the chines, keel, and bow shape being relatively unimportant. It is natural, therefore, that step drag reduction has been the primary target in recent investigations.

The purpose served by the step is to break the water flow over the bottom of the hull at a point approximately where the normal pressure from the water diminishes and farther aft changes to suction. The position is chosen a short distance aft of the c.g. Due to this suction, a hull without a step cannot leave the water and, therefore, any improvement in shape aerodynamically must not adversely affect ventilation aft of the step. Experimental work indicates that the drag of the basic streamline form need not be "spoiled" to a greater extent than 10 to 12 per cent in converting it to a satisfactory hull form. Retracting the step completely has been tried full-scale, but the additional weight, cost and maintenance difficulties causes the method to be of doubtful advantage.

Interrupting the water flow by compressed air ejected through slots or nozzles at appropriate positions in the bottom has also been investigated. This system is found to be successful hydrodynamically but suffers from the same objections as a retractable step. The addition of hydrofoils, to eliminate the necessity for steps and chines, holds out some prospect of success, but there are a number of problems yet to be solved. Hydro-skis have also been investigated; they can be completely retracted but involve increased water resistance and require surplus power at take-off. One form of hydro-ski system is, in effect, a highly loaded retractable bottom. Reduction of the water loading would have the effect of reducing the resistance and it is possible, therefore, to foresee a fully retracting flying-boat bottom. Weight, cost and maintenance again will decide whether this would be worthwhile.

Improvement in water resistance has also had its share of research. The water-resistance components are: that due to wave-making, which diminishes as the wing lift increases and becomes unimportant beyond the "hump" speed; planing resistance, which is, in fact, the horizontal component of the normal force on the planing bottom; and, finally, the skin friction. The resistance for a given boat varies considerably with attitude; hence, if it is possible to maintain optimum attitudes throughout the take-off run, some reduction in resistance can be made. However, it is considered that for the future commercial flying-boat there are only limited improvements which can be applied. At present a refined form of hull on the conventional pattern can have a peak resistance weight ratio of 0.18.

Probably the most important factor in determining the general

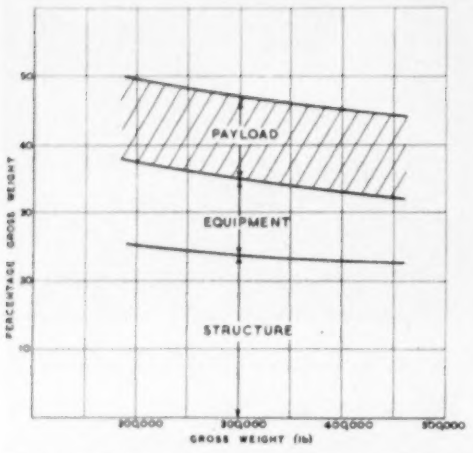

Fig. 1. Typical variation of structure, equipment and payload as a percentage of the gross weight for varying sizes of large transports.

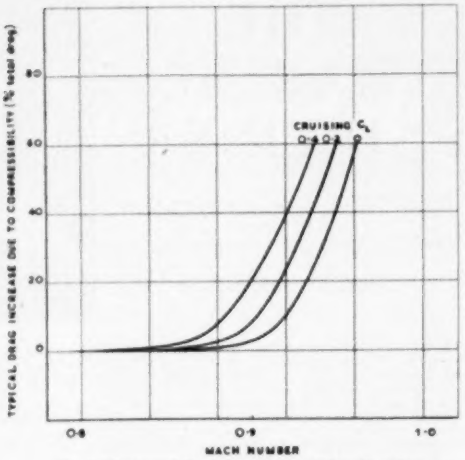

Fig. 2. Compressibility drag increase at three C_L values.

THE MARINE AIRLINER . . .

configuration of a flying-boat is the propagation of spray. This occurs in two forms : that emanating from the forward contact of the planing bottom with the water surface (ribbon spray), and the "blister," which leaves the chine at its forward point of contact with the water. Both forms of spray are due to peak pressures developed in the stagnation area where the planing bottom meets solid water. Ribbon spray is fairly light and although it may cause inconvenience it does not damage the structure, and since it first travels forward over the bottom surface it can be directed downward by curvature below the bow chine. On the other hand, the blister has free release laterally and rises in a hollow cone of heavy spray. The height to which it rises determines the relative position of the airscrews above the water and, in some cases, the position of the wing and tailplane.

Recently, continued the lecturer, it came to light that the coefficient of water loading proportional to beam cubed (previously considered to be the major factor in determining spray height) could be replaced by a coefficient proportional to the square of the planing-bottom length multiplied by the beam. At once the way was open to the use of hulls of greatly increased fineness ratio without adverse effect on the water behaviour of the hull; in fact, it is claimed that there is some improvement in seaworthy qualities.

From the aspect of future design this new conception is of the greatest importance, since it permits us to decide the cross section of the hull primarily from the requirements for passenger accommodation rather than from the necessity for a specific planing-bottom width. It is also possible to reduce drag and by the consequent reduction in step width to reduce spoiling drag. The fineness ratios of hulls are tending to increase from about 6 : 1 to more than double this ratio.

The water stability of the flying-boat does not enter into this enquiry except, perhaps, in regard to the lateral stabilizing which is necessary. It is not considered necessary to use wholly retracting floats, since experience has shown that the weight of reinforced structure in the neighbourhood of the float recess offsets any fuel saving. On the other hand, floats of suitable design retracted to the wing tips, by improving the induced drag due to increased aspect ratio and end-plate effect, are capable of largely compensating for the rise in profile drag.

Returning now to our discussion of transport efficiency, this is dependent on a number of factors, the most important of which are the ratio of tare weight to all-up weight and the cruising L/D ratio. In regard to the former, there have been two misconceptions which have had to be overcome by protagonists of big flying-boats —that the flying-boat is necessarily heavier than the landplane, and that the law of scale increase (the square/cube law) applies adversely to the structure weight as aircraft size is increased. The flying-boat has survived the attack with flying colours, since it is now generally agreed that in the largest sizes it can be built lighter than a corresponding landplane.

The factors influencing the structure weight are : the body size; the wing area and configuration; the tail surfaces; and the wing-tip floats. In Fig. 1 it will be noted that the structure weight percentage improves as size is increased. This is attributed to a reduction in body surface area relative to the volume, and to permitting the wing loading to increase and the aspect ratio to decrease. The weight of equipment comprises those parts which vary in weight with size, the remainder being common to all aircraft—e.g., in the former is included the passenger seats, in the latter the control-cabin equipment. In Fig. 1 the curve for equipment, plus structure, slopes down with increasing size of aircraft and shows a useful gain in disposable load.

To cruise at the Mach number chosen, consideration will have to be given to wing loading as well as to the configuration. Here we must compromise since M_{crit} will change with the C_L; this is shown in Fig. 2. The profile drag of the body is also dictated by the volume necessary for the payload. We see, therefore, that with increasing size of aircraft the factors affecting both the profile and induced drag will vary, and the changing D/W which can be achieved under mean flight conditions is shown in Fig. 3. It will be noticed that small variations are made in this to cover the effect of different forms of propulsion. The curve of D/W is that associated with the C_L for mean cruising operation at the chosen Mach number.

These curves indicate a general improvement in profile C_D when

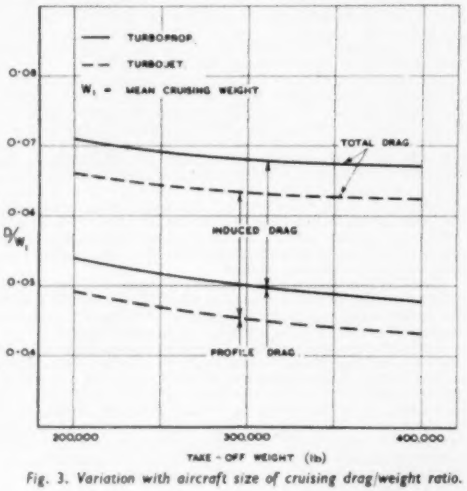

Fig. 3. Variation with aircraft size of cruising drag/weight ratio.

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THE DE HAVILLAND DH.110

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THE HAWKER HUNTER

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ENGINES

WORLD'S LARGEST PACKAGE?

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THE MARINE AIRLINER . . .

the size of aircraft is increased. It will be seen that this improvement is partially offset by the increase in induced drag arising from the greater wing loading and reduced aspect ratio used in larger aircraft in order to avoid an increase in structure weight.

The speed requirement appears to eliminate the use of piston engines, although their fuel economy (in compounded form) makes their use attractive from other aspects—in particular the high propulsive efficiency obtainable with large-diameter airscrews. The Froude analysis of propulsive systems shows that, to improve efficiency, the amount of energy wasted in the form of slipstream kinetic energy should be reduced while the rate of momentum change through the disc area is maintained. Hence, the mass flow must increase and the slipstream velocity reduce, a condition best met by an airscrew.

The turboprop, in common with the turbojet, is capable of high thermal efficiency in the high-altitude conditions favourable to high-speed flight. At M=0.83 the airscrew tips will be supersonic, involving a large loss of efficiency. But it is possible to design especially for supersonic tip speeds while retaining an efficiency of about 75 per cent. It is, however, impossible to avoid the serious disadvantage of excessive noise.

This is the day of the turbojet, which has low installed weight and adds little to the aircraft drag. These two attributes make it a serious competitor to the turboprop, even where long range is required. The turbojet also gains at high speed due to ram effect.

Although the ducted-fan engine has had, as yet, little development, its high propulsive efficiency at the specified speed makes it attractive, the efficiency falling between that of the straight turbojet and the turboprop. The weight of gearing is eliminated, but the complexity of the fan drive makes it necessarily heavier than the turbojet. From the aircraft design aspect it introduces installational problems difficult to solve; probably the most effective method is to "pod" a ducted fan, and accept the additional drag and weight entailed. The ducted fan in low ratios of mass flow becomes what is termed a by-pass engine. In this form it has the advantage that, by mixing the jet streams, heat exchange takes place, with some advantage to efficiency. The by-pass engine is little heavier than the turbojet and when installed is as clean aerodynamically.

In order that comparisons can be made between various power plant installations, estimates have been made based on the most recent trends in specific weight and overall thermal efficiency for the types of propulsion available. The characteristics used are considered to be representative of the present state of the art and normal component efficiencies, combustion temperatures and compression ratios have been assumed.

In the estimates of range performance (Fig. 4), the thrust to maintain a cruising speed of 550 m.p.h. on a family of aircraft of differing weights has been found, and the basic engine power and weight derived. The take-off problem on aircraft with turbojet power fixes a minimum limit to the thrust/weight loading compared with that needed for cruising. Assistance at take-off can be used to lower this limit, and a ready means of doing this is the use of water injection into the jet units during the take-off run. An augmentation of thrust of 15 per cent is a reasonable assumption and this method has been adopted. The five types of engine represented are shown on curves of equivalent still-air range for aircraft of increasing take-off weight.

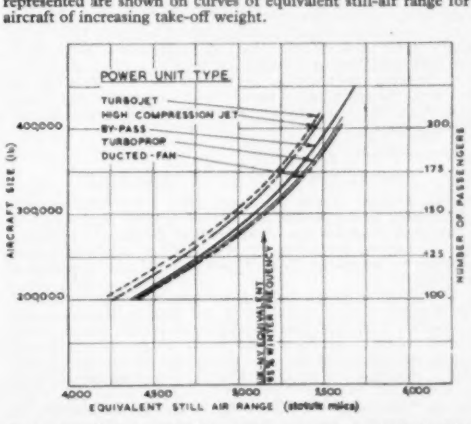

Fig. 4. Aircraft size required for varying range with a payload of 12 per cent of the all-up weight.

Fig. 4 can be used to predict the size of aircraft necessary for operating various long stage flights. For instance, the equivalent still-air range required for the England to New York non-stop journey is 5,150 miles, including allowances, reserves of fuel, and 85 per cent winter frequency of headwinds. It will be seen that aircraft weights of 335,000 lb down to 300,000 lb are necessary for aircraft fitted with engines from turbojets to turboprops respectively.

We are now in a better position to judge the suitability of each of these types of power for long-range, high-speed operation. It has already been stated that the supersonic propeller may not be found suitable for passenger transport because of excessive noise which is well-nigh impossible to reduce within the limitations of aircraft design. Nevertheless, it will be seen that, provided a propeller efficiency of 75 per cent can be obtained, the turboprop gives the best overall performance. The ducted fan appears to have much to recommend it but, owing to its high slipstream velocity, it must be mounted clear of wing and structure and it has a high noise level. The overall efficiency falls very close to that of the turboprop. It would appear that a by-pass engine might be the solution to the present problem. The overall efficiency is little short of that of the two already mentioned, and such an engine can be installed far aft in the aircraft, the jets being behind the habitable part of the body.

It will be seen, therefore, that if the choice of power is the by-pass engine, the aircraft for the direct Atlantic journey is about 310,000 lb in weight. It will have a landing speed of 130 m.p.h. and, in landplane form, the take-off from an aerodrome would require a runway length of about 3,300 yards. A payload of 12 per cent on this aircraft represents a passenger complement of 150 with provision for luggage, mail and freight.

The block time of the westbound journey under average headwind conditions and with reasonable stand-off time allowance will be about eight hours, thus making a daily return trip possible. On a *local time* basis the aircraft leaving England, say, at mid-day would, after eight hours' flight, arrive in New York at 3 p.m. The same aircraft, after three hours turn-round time, can leave New York at 6 p.m. and arrive back in England about 6 a.m. the following morning, the journey having taken one hour less. This leaves six hours in hand for servicing before leaving again at mid-day.

The attraction of an aircraft such as this needs no further argument. This enquiry has been made with the use of flying-boats in view, and we see that even larger craft than 310,000 lb will be possible, especially when new aerodynamic and propulsive improvements become available. The subject of aircraft of very large size naturally leads to discussion of runway problems. When London Airport is completed, an area of well over five square miles of concrete paving will have been laid. The maintenance of airports is a heavy charge on the State—e.g., £2.8 million in 1951 over and above what is recovered from airline operators. Already there is an outcry against the danger and noise associated with airports adjacent to built-up areas. The requisitioning of vast areas, the loss of valuable agricultural land, and the prohibitive cost of new construction, has resulted in authoritative statements, in which the belief has been expressed that the flying-boat is the logical solution to these and a number of other difficulties associated with future long-range passenger transport.

It should be realized that the attainment of long range and aerodynamic efficiency on an aircraft is not the whole story, since high cost of operation may eliminate its practical application. An approach has, therefore, been made to this problem by the use of the standard costing method recently drawn up by the Society of British Aircraft Constructors.

Operating costs are divided into annual costs, such as obsolescence, insurance, etc.; fixed hourly costs, such as maintenance and overhaul; and hourly running costs, such as fuel, crew, etc. On the other hand, revenue is dependent on payload, distance and rate of delivery—hence high-speed transport, although involving increased operating cost, may well show a better economy than smaller, slower, and apparently cheaper aircraft. It should also be remembered that journeys interrupted by refuelling stops are, in effect, a series of short journeys which include landing fees, ground costs and added flying time to carry out the let-down and re-climb routine. It is also clear that the daily return journey made possible by the high-speed airliner makes a high utilization possible. For instance, the aircraft cited above could well have a utilization of 4,000 hours although credited with 3,000 hours only in the cost estimates which have been made.

Fig. 5 shows the cost per passenger mile of the family of flying-boats designed for varying stage distances, the number of passengers carried being shown in Fig. 4. The cost of carrying passengers on a given aircraft rises with stage distance but, due to the improvement in tare weight and aerodynamic efficiency with increasing size, the direct operating cost per passenger mile actually reduces as the range for which the aircraft is designed rises, and compares favourably with any existing aircraft. These results will be surprising to many who have previously thought in

THE MARINE AIRLINER . . .

terms of large machines being economically inefficient. The estimates which have led to these curves show this to be wrong.

First-class traffic is likely to go to the biggest, most comfortable and fastest airliner and, because of this, high load-factors are probable. It may not be generally realized that the load-factor is more important than any other single item in the operating economy of a commercial aircraft. From Figs. 4 and 5 the size of flying-boat and direct operating cost has been found for the North Atlantic direct flight, but there are other journeys on which intermediate stages can be omitted. Among these are : a two-stage route to South Africa; two stages to South America; one to India; and three stages to Australia. For these journeys the longest stage distance is equivalent to about 5,700 miles, and it can be seen from Fig. 4 that this distance is possible with a flying-boat of the type discussed, of about 450,000 lb all-up weight.

Before closing this paper [said the lecturer], it is proposed to consider a few of the improvements which can be foreshadowed for the future which will increase the range of a given size of aircraft or permit a smaller one to attain the same performance. On the question of turbine engine developments I am indebted to F. Owner for the assistance given by his paper "The Application of Power to Aircraft,"* where the effect of increased combustion temperature and compression ratio on the specific thrust and fuel consumption of turbines is discussed. Under the flight conditions with which we are dealing, the general effect of increasing the combustion temperature is to improve the specific thrust of a turbojet but also, perhaps, to increase the specific consumption. An increase in compression ratio has the effect, within limits, of reducing the specific consumption, but the gain is not large and may be no more than 10 per cent for a large increase in complication.

The effect of changing operating conditions on a turboprop are more beneficial. A rise in combustion temperature has the effect of improving the specific power output without making any difference to the specific fuel consumption, but increase in compression ratio improves the latter whilst having little effect on the specific power. By-pass engines and ducted fans show improvements due to rise in combustion temperature and compression ratio which lie between the turboprop and the turbojet. The by-pass engine could also benefit from a limited increase in mass flow ratio up to about 1 : 1. It is probable that during the next few years improvements will be made in this type of engine, making it still more suitable for the high-speed flying-boat.

Much attention has been directed recently to methods of drag reduction by controlling the boundary layer behaviour by suction or other means. No attempt is made here to estimate the possibilities in this direction, but there are clearly big increases in transport economy—possibly 20 to 30 per cent—which can result if an application can be made which is also a sound engineering proposition. Whatever the solution, it is almost certain that it will be applied in conjunction with turbojet propulsive systems. The curves in Fig. 4, it will be noticed, have a limiting range under the conditions assumed of below 6,000 miles. The improvements in power and drag-reduction mentioned will extend this range considerably, but there will still be a limitation unless new power principles come into use.

The generation of power from nuclear fission is shortly to have application in both the supply of electrical power and as a motive force for a submarine. It is reported also that studies are now being made in America for an atomic-powered aircraft. [Two prototypes are being built by Convair and Boeing.—ED.] There is no clue, so far, as to the method of converting the energy into thrust, but it can be inferred that vapour-driven turbine engines with propellers or ducted fans will form the power units, at least in early installations. The weight of reactor unit, controls and screening will be high; this part of the installation takes the place of the fuel load in conventional aircraft. Therefore, provided the reactor unit weight is known, an approximate approach to the aircraft weight can be made. In the largest of the family of aircraft discussed the percentage weight of fuel available is about 45 per cent after allowing for the weight of turbine and airscrew. It will be seen, therefore, that if the reactor weighs 100 tons, an aircraft of about 500,000 lb weight will be necessary.

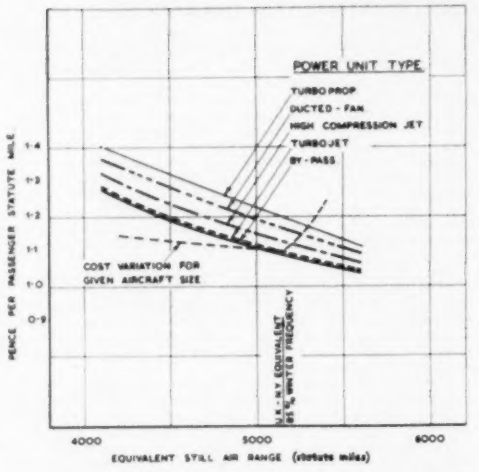

Fig. 5. Direct operating cost per passenger-mile plotted against design range for 12 per cent payload.

The atomic-powered aircraft will cruise at constant weight and power throughout the flight, and it can be assumed that, for economic reasons, the cruising power will approach the maximum of which the plant is capable. As a consequence, for take-off and initial climb, assistance from some other form of energy, such as liquid rockets, will be necessary. In order to reduce power assistance as much as possible it will be wise to make the take-off from water, where runway length is unrestricted. Since the weight of fuel consumed is insignificant, the design optimum aerodynamic conditions should prevail throughout the flight, and an unusual condition is met in that the take-off and landing weight are the same. The possibility of landing flying-boats at their take-off weight has always been recognized as an acceptable manoeuvre. The unobstructed approach run, unrestricted landing area, and short run after touch-down reduce the landing hazard, and the shock-absorbing properties of a vee bottom ensure low landing accelerations even at overload weights.

To conclude his paper, Mr. Knowler returned to his original theme and showed, by way of summary, an artist's impression of the type of flying-boat airliner which had been under discussion. This drawing appears at the top of page 349. His intention was to predict the design which would attract the traveller by its speed and by what could be called the "flying-boat's traditional comfort," while remaining a commercial proposition.

* *Proceedings of the Joint Engineering Conference*, 1951.

AMERICAN SAPPHIRE PRODUCTION

A SPOKESMAN for the U.S.A.F. recently announced in Washington that the production of the Wright J-65 turbojet (Armstrong Siddeley Sapphire licence) had been "slowed", and that deliveries were about eight months behind schedule. The programme, however, was not considered a failure in any sense, and the U.S.A.F. intended to continue with it though original plans had been somewhat altered because of delivery delays and recent economies.

Reporters asked U.S.A.F. officials to comment on a report by the *Washington Evening Star* that only a handful of J-65s had been produced in eighteen months for the expenditure of four hundred million dollars (£143 million). The reply was that the actual expenditure was classified as secret information though it was considerably less than four hundred million dollars. A year and a half was not considered an excessive amount of time for setting up plants, developing a pool of trained manpower and installing new tools and equipment.

SPICER ESSAY CONTEST

THE Dorothy Spicer Memorial Prize Essay Contest, held annually by the Society of Licensed Aircraft Engineers, was established to further one of the ideals of the late Miss Dorothy Spicer, namely, the advancement of aircraft engineering, particularly in improving airworthiness and the safe operation of aircraft.

Details of the contest for next year have now been announced. All licensed aircraft engineers in the British Commonwealth, Colonies and Protectorates are eligible to submit entries, which should not be longer than 5,000 words. Essays may be written on any subject pertaining to the construction and/or maintenance and/or overhaul and repair of aircraft. The final date of entry is March 31st, 1953, and the prize for the contest is £10. Entry forms, rules, suggested essay subjects and further information may be obtained from the general secretary of the Society of Licensed Aircraft Engineers, at Finsbury Circus House, Blomfield Street, London, E.C.2.

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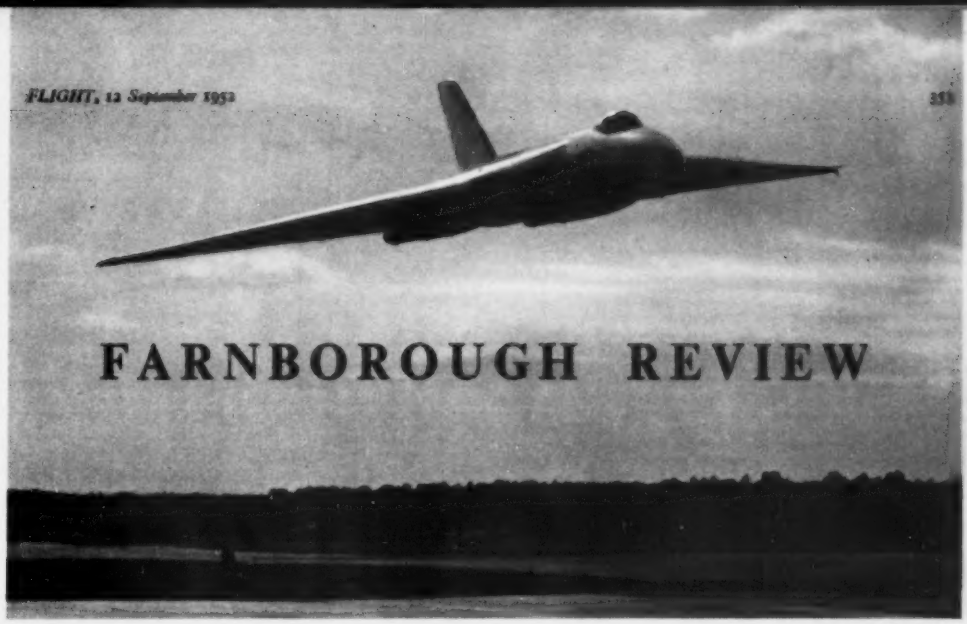
DH AIRCRAFT

DH ENGINES



FARNBOROUGH REVIEW

"*Flight*" *Photographs*

HAVING reported last week our early impressions of the S.B.A.C. Display, it remains to supplement these with some general and detailed observations.

On Monday, September 1st, it will be remembered, the weather was excellent and the flying programme went through with perfect smoothness (except that a ban on supersonic bangs was enforced). Tuesday—when the occasion was graced by a visit from the Duke of Edinburgh—was another day of near-perfect weather; and on this day the supersonic ban was lifted and the flying programme slightly rearranged. Though John Derry in the D.H.110 did, in fact, surpass Mach 1, the associated noise was not heard on the airfield. Neville Duke in the Hunter produced his own "Farnborough report" after the display was over.

Wednesday brought low cloud and occasional drizzle, and the flying display, which was to have taken place in the morning, was held over until the afternoon. But the generally unpleasant conditions caused the Avro 698, Saro Princess and Bristol 173 to be withheld from the flying programme, for no chances are being taken with these machines at the present stage of their development. On this day there was a memorable silence on the airfield for perhaps five minutes, while Derry, somewhere above the cloud which curtained his performance, dived the 110 from 43,000ft until his Mach needle showed him he was through the sound barrier. Nothing was heard, however, by the audience and Derry climbed for a second attempt. On this he was successful. Twin cannon-cracks assailed the spectators' ear-drums, and within a few seconds the black fighter came streaking through the cloud less than a mile from the runway.

In a similar attempt Neville Duke was unsuccessful, though he obliged with one of his runway-scaring passes. Incidentally, in this pastime he is now keenly rivalled by David Morgan, who on Wednesday, not only undercut Duke's height but, we should guess, fully equalled his speed. Morgan's performance was, in fact, altogether outstanding on this day, as was that of Heyworth the Elder in the reheat-Avon Canberra. One of Heyworth's passes was, perhaps, the lowest yet made by any jet aircraft at any Farnborough Display.

On this day the guests included Prince Bernhard of the Netherlands, Viscount Alexander, Minister of Defence (who arrived by helicopter), and Mr. Geoffrey Lloyd, Minister of Fuel and Power.

For Thursday's display—the last of those "by invitation only"—the weather was indifferent to poor, with medium and high cloud. Both Hunter and D.H.110 planted a brace of bangs squarely on the airfield and the 110 proceeded with its shattering performance in a rain shower. The Avro 698 was more astounding than on Tuesday: on a slow run its speed was estimated by pilots who should know at 110 kt, its fastest pass at 375 kt and the height of a zoom—at the peak of which Falk banked over the vertical—at 6,000-7,000ft. Other excellent shows were put on by Lancaster (Meteor N.F.11), Porteus (Aiglet Trainer), Runciman (S.A./4) and Lithgow (Supermarine 508). When Lithgow suddenly lowered his wheels an emergency landing appeared imminent; but he was only losing speed for an amazingly slow run.

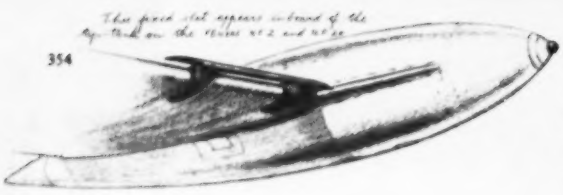
MILITARY AIRCRAFT

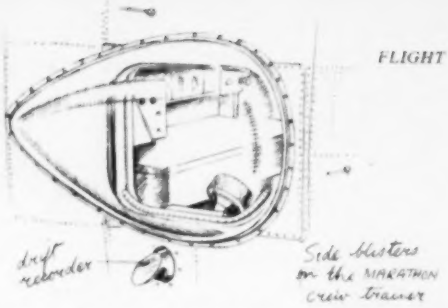
To the Avro 698 and to its pilot, W/C. R. J. Falk, go the laurels for the most significant performance of the whole week, as reported in our previous issue. Points of interest on this bomber are the "pillar box" intakes for the four Rolls-Royce Avons, wherein bifurcation is visible just aft of the leading edge. There is a pronounced shoulder between the inboard lip of the intake duct—where there is a boundary layer guard—and the fuselage. Registered VX770, the 698 carries a ribbon braking-parachute in the tail-cone. In side elevation there is a very pronounced sweep-down of the top fuselage line to the nose but the lower fuselage line appears perfectly straight. The broad bomb-bay extends for about a third of the fuselage length.

Paired, gate-type air brakes are positioned on the wing in way of the turbojet fairings, a few feet aft of the leading edge, on upper and lower surfaces. The small area of transparency in the

Pride of place—at the head of the page—is accorded the sensational Avro 698 bomber. Immediately below is the Fairey Gannet A.S.1.

The Westland Wyvern T.F.4 was demonstrated in dashing style with a bibulous-looking, red-nosed torpedo, and 16 red R.P.s.





FARNBOROUGH REVIEW . . .

cockpit enclosure bespeaks a very high level of pressurization.

Among the fighters, the multi-purpose, all-weather Gloster Javelin and D.H.110 command the greatest interest, the Hunter and Swift having previously been seen in public. The Javelin displayed—WD808—differs from WD804 (written off in the accident which occasioned Bill Waterton's George Medal) in that the rear-end fairing is now straight in side view. The radar operator sits in a second cockpit, which has a hinged roof and small portholes. For his Farnborough demonstrations Waterton was restricted to 400 kt, though at times he appeared to exceed this figure.

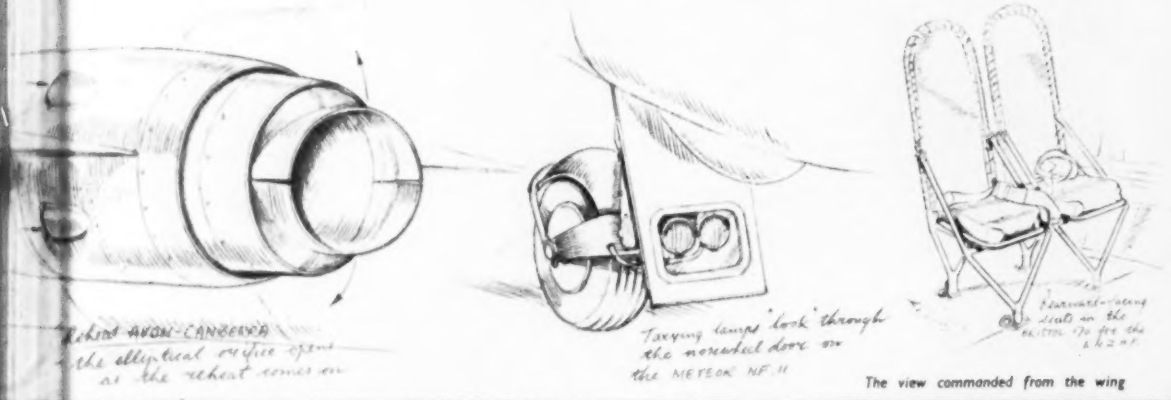
The performance of the D.H.110 (WG240), on the other hand, was quite uninhibited. In plan view the tail-booms are of quite broad cross-section as far aft as a point opposite the end of the jet-pipes; thereafter they taper sharply. The flaps are of Fowler type. On the starboard side is a large entry-door, hinged at its forward end and containing the radar operator's window.

The second Hawker Hunter prototype, WB195, has a modified tail unit, as shown in one of our sketches, and from the first production-model Supermarine Swift (WK194), which took over from WJ965 early in the week, the A.S.I. boom has been removed. The Supermarine 508 displayed was the second prototype, VX136.

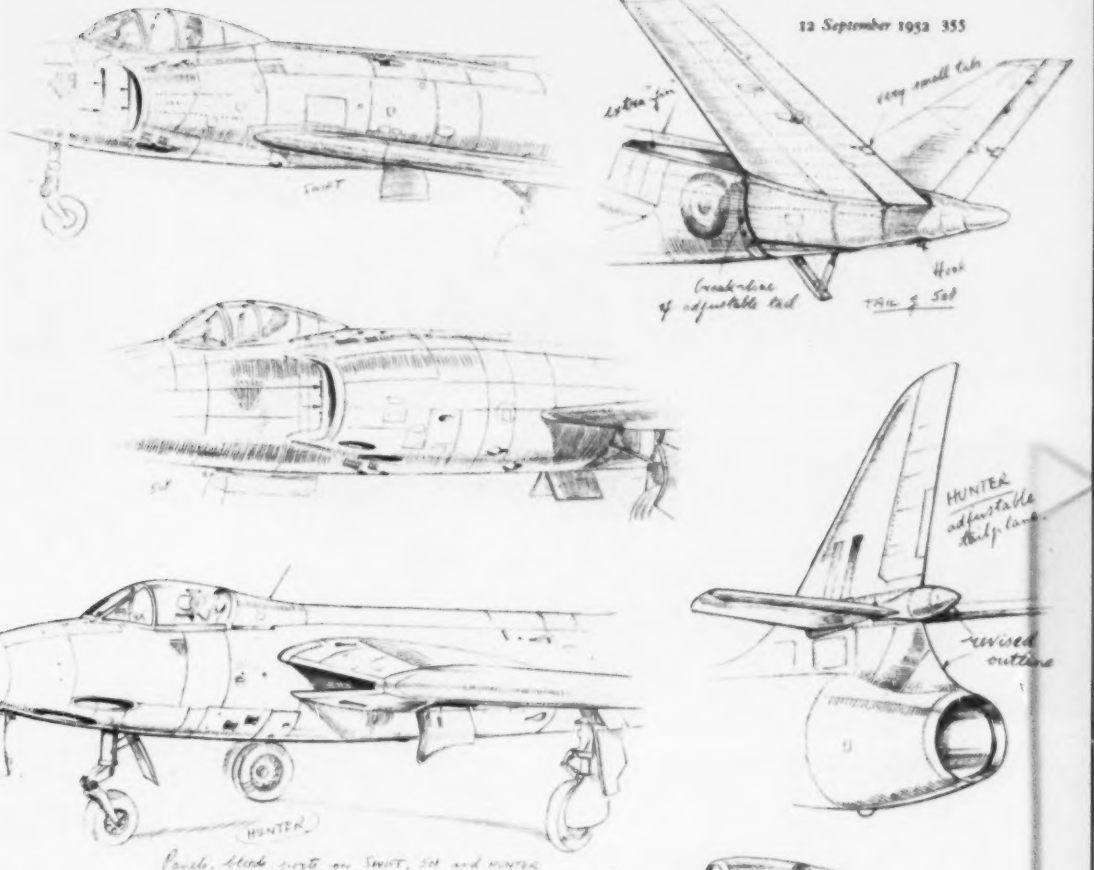
HELICOPTERS

The projected Fairey Rotodyne helicopter shown in model form, and described briefly in our issue of August 29th, will have an all-up weight of 31,000 lb, a useful load of 13,000 lb, and an endurance of 2 hr at 175 kt cruising speed. The five hollow rotor blades give a rotor diameter of 80ft, and the two turbo-props in the fixed wings drive three-bladed electrically operated v.p. airscrews designed and built by the company's Propeller Division. These are of 11ft diameter, and are similar to the four-bladed unit fitted experimentally to a Firefly two years ago.

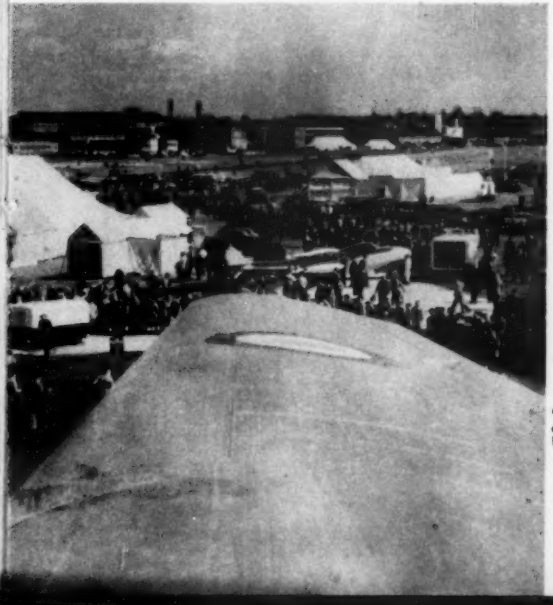
The next steps in the development of the Rotodyne will be the completion and flight-testing of a jet-driven version of the

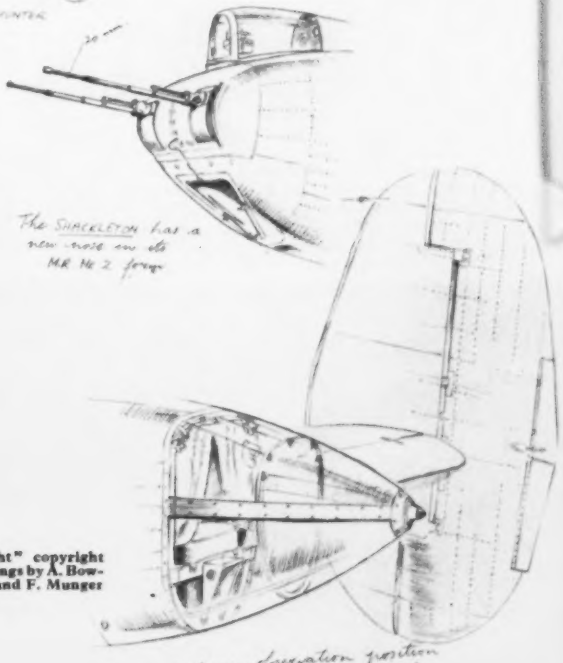


The view commanded from the wing

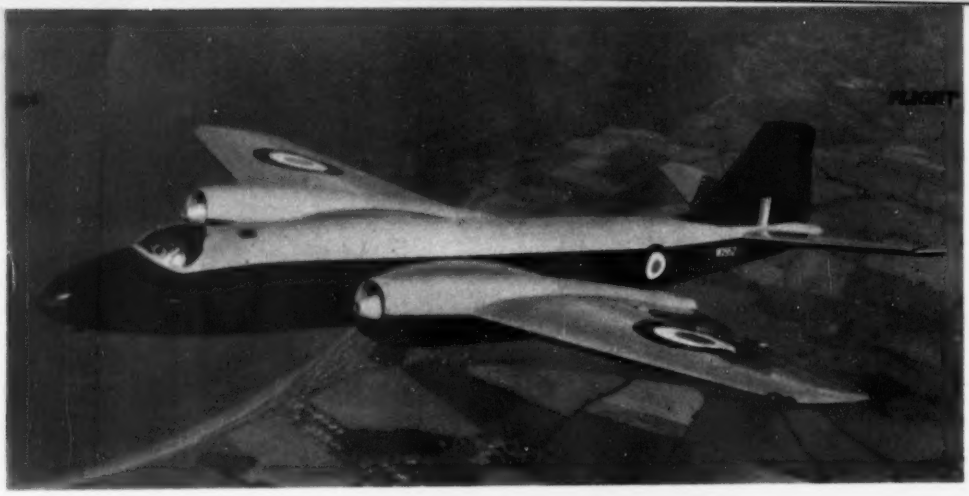


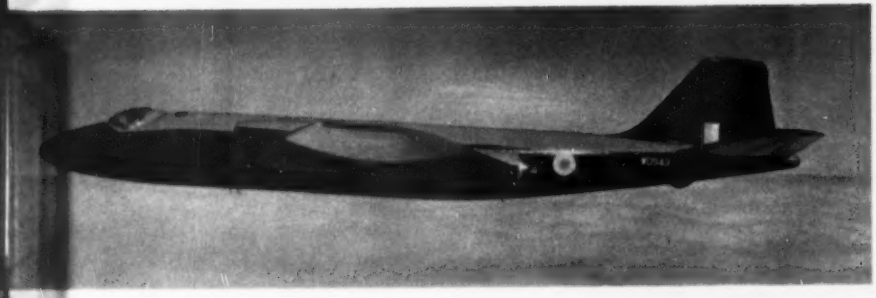
of the Blackburn Universal. "Secret" types had an enclosure on the far side.





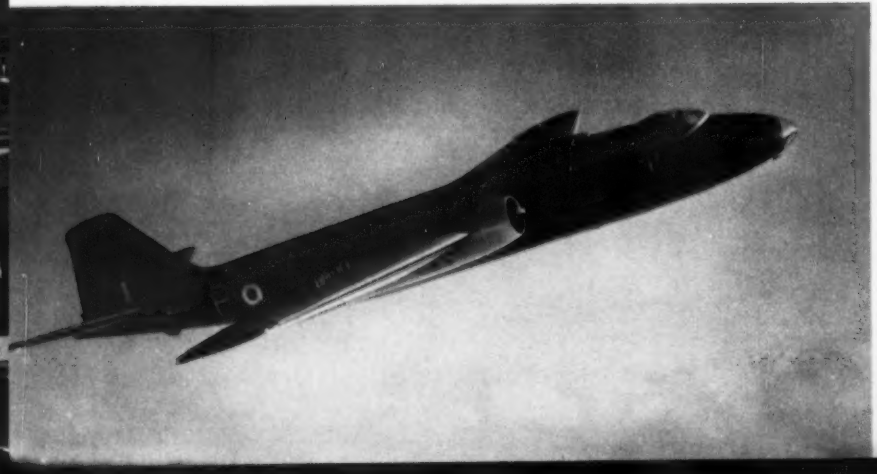
"Flight" copyright drawings by A. Bowbeer and F. Munger



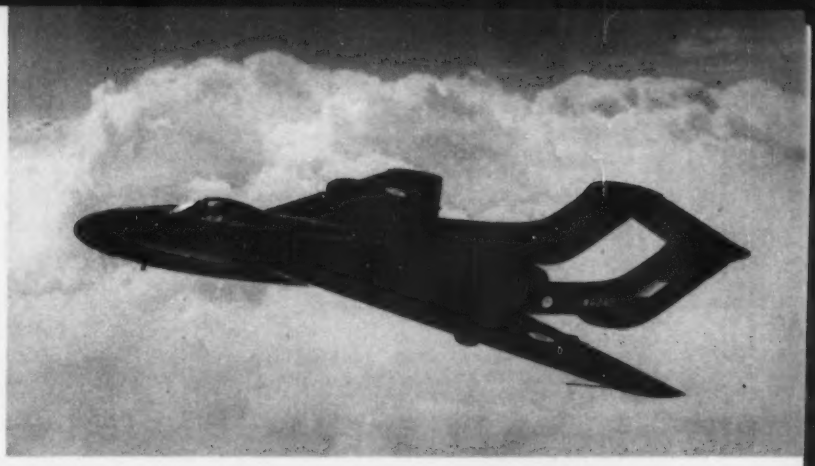


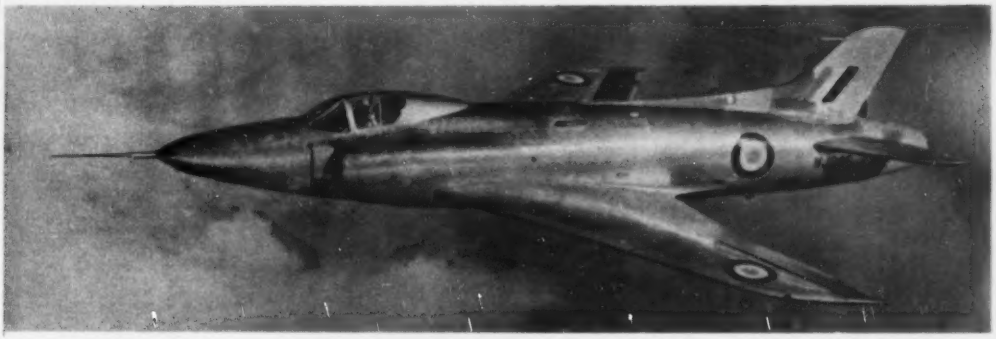
FARNBOROUGH REVIEW . . .

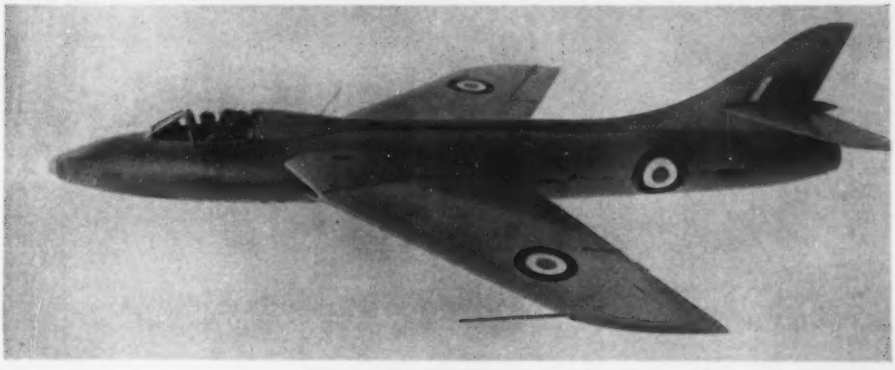
ON these two pages are air-to-air impressions of some of the aircraft displayed last week at Farnborough; several studies, in fact, were secured in the vicinity of the circuit by a "Flight" cameraman when the demonstrating machines arrived at the week-end preceding the show. Three test-bed versions of the English Electric Canberra are shown on this page, headed by the Olympus-powered example flown by Walter Gibb, the test-pilot charged with initial flight development of these 9,750lb-thrust Bristol turbojets. Immediately above and below are, respectively, the reheat Avon-Canberra (flown, on different days, by H.N.D. Bailey, A. J. Heyworth and J. H. Heyworth) and the Sapphire-Canberra (pilot, R. B. Prickett). The two Short S.A.4 experimental prototypes (right) are also Avon-powered; the second, painted silver, appeared at Farnborough this year.



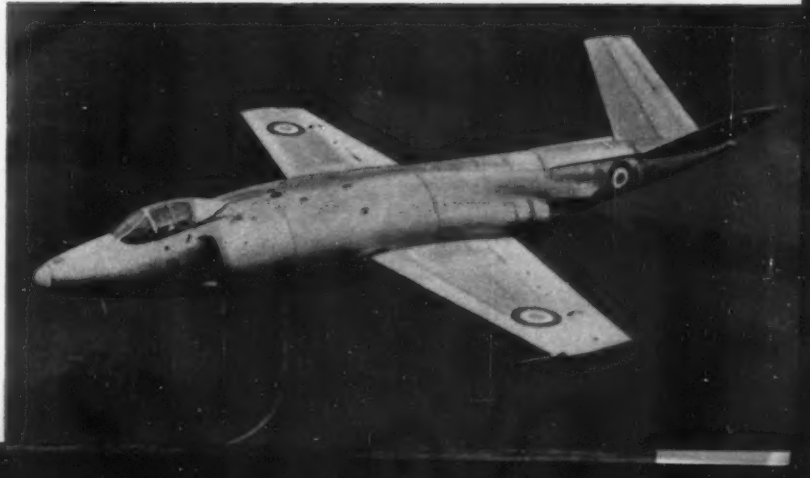
(Right) A bright cloudscape sets off the black, sinister form of the supersonic D.H.110 all-weather fighter, flown by John Derry, which reached 700 m.p.h. on the opening day of the S.B.A.C. Show. "Mach point nine plus" was also attained in front of the enclosure by Vickers-Supermarine's silver Swift (below), which made its Farnborough debut in the hands of David Morgan.





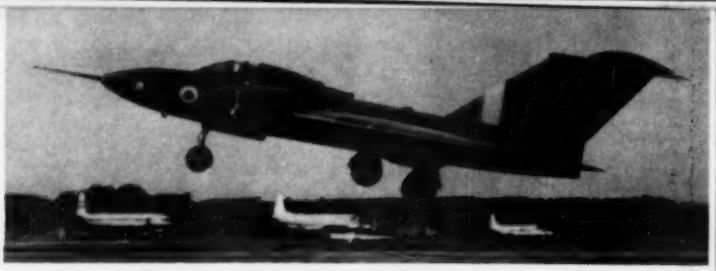


Neville Duke, in white Lombard helmet, is glimpsed (above) in the second prototype Hawker Hunter, powered—as is the Swift—by a single Rolls-Royce Avon. Like the "110", the Hunter demonstrated the "supersonic crack" during the period of the display. Exceptionally rapid ascents and low-speed manœuvrability were the themes of Mike Lithgow's performance in the twin-Avon Supermarine 508 (below).



FARNBOROUGH REVIEW . . .

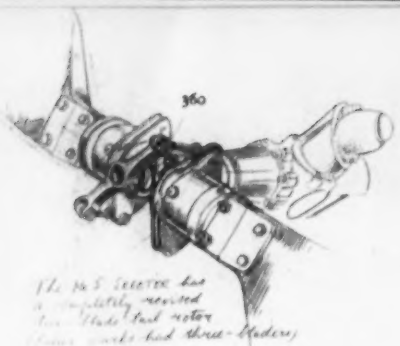
Take-off portraits of two Hawker Siddeley products are reproduced on the right. In the upper view, Bill Waterton can be seen in the hefty twin-Sapphire Gloster Javelin all-weather fighter. Although the docility of the delta is fast becoming a by-word, the low-speed manœuvrability of the Javelin must be seen to be believed. Beneath it is the dainty Hawker Sea Hawk (R.-R. Nene), a Royal Navy production machine flown by Bill Bedford (who is, incidentally, the holder of four National gliding records). At 52ft, the Javelin's span is 13ft greater than that of the Sea Hawk; its length is 57ft, compared with the Sea Hawk's 39ft 7in.



The second Vickers Valiant, WB215, powered by four Rolls-Royce Avons, is seen (right) during one of its very fast runs at low level. It was piloted alternately by G. R. Bryce and E. B. Trubshaw, who are both former members of the King's Flight; D.H. test-pilot R. Plenderleith, in a modified Venom (above, right) demonstrated the Ghost with two-stage reheat. By the spraying of neat fuel into the tailpipe, reheat gives a powerful burst of extra thrust—and extra noise, as Farnborough spectators will testify. Another Hatfield product at Farnborough (above) was the Heron (powered by four Gipsy Queens), which was flown by D. B. Taylor. This particular aircraft, D.H.'s demonstration model, G-ALZL, wore the scarlet-and-white insignia of Japan Air Lines, who take delivery of their first Heron next year.

(Above) Avro pilot John Baker gave Farnborough a "sub's-eye" view of the latest Mk.2 Shackleton for Coastal Command. Visible above are the twin 20-mm guns, sighting blister and aiming panel in the modified nose; the telescopic ventral radome is seen in the fully extended position. A brief but breath-taking glimpse of the Meteor 7 (right) was afforded when Mike Kilburn swept over the enclosure in a wide inverted turn. Noticeable here are the large-diameter, shortened nacelles of the Derwent turbojets. The stately Britannia's take-off (below) was even quieter than many people had expected; "Bill" Pegg, Bristol's chief pilot, gave a fine display of the new airliner's handling qualities. The picture, incidentally, affords an interesting glimpse of undercarriage-retraction; the main four-wheel bogies fold parallel with the oleo legs before tucking into the nacelles.

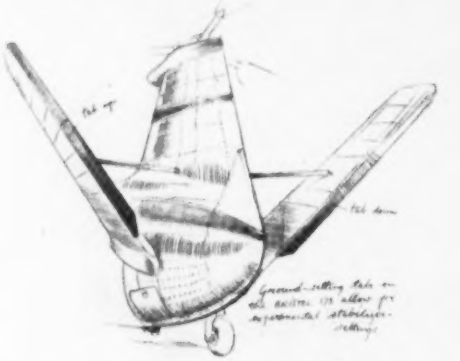
"FLIGHT"
Photographs

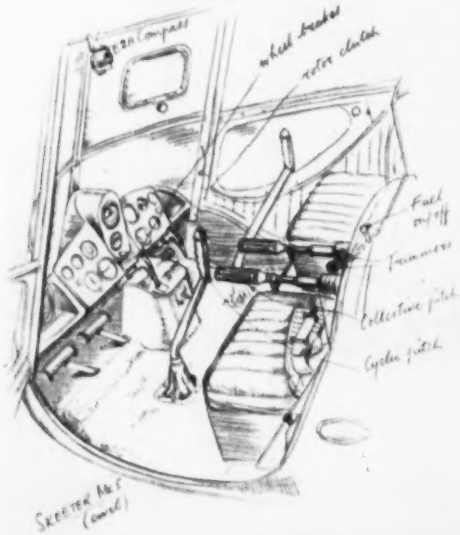


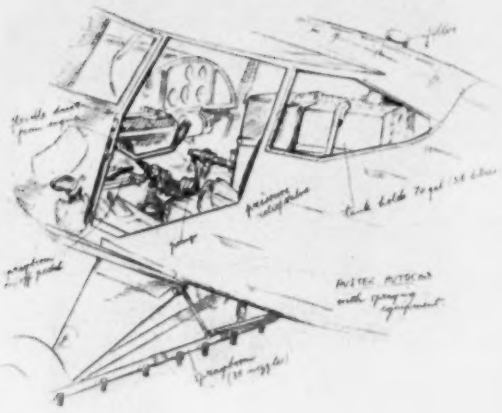
FARNBOROUGH REVIEW . . .

second prototype Gyrodyne, G—AJJP. It will be remembered that the Gyrodyne, holder of the British speed record for helicopters, has a piston-engine-driven main rotor to provide lift, and a single wing-mounted airscrew to provide thrust and counteract rotor torque.

A civil Saunders-Roe Skeeter—the Mk. 5—was on view in the static park. It has a two-blade tail rotor. The brisk flying demonstration by the Skeeter Mk. 4 serves to reinforce the remarks made by its pilot, J. J. M. Jeffery, in an article in the current issue of the makers' house-journal *The New Slipway*, in which the numerous applications of this type are discussed. Among the more unusual of these are police work ("one must not forget the possibilities of such transport for the control of riots") and the actual use of an American helicopter for "crop-picking," by *blowing* walnuts off trees, preparatory to subsequent easy collection.







CIVIL AIRCRAFT

Although only one completely new commercial aeroplane appeared in the S.B.A.C. programme, no lack of progress should be inferred. Previous Farnboroughs have featured prototypes in greater numbers, but this year the accent was on quantity production for daily airline work—an aspect more attractive to manufacturers and operators alike. The Comet, for example, is now in regular service on two B.O.A.C. routes; the Corporation has received its quota of nine Comet 1s, and the example seen at Farnborough was the first Series 1A. This aircraft, due for delivery in two or three months' time to Canadian Pacific Airways, was fitted as a 44-seater (a type of interior which will probably be adopted by other Comet 1 operators). Standard B.O.A.C. designed Slumberseats and interior decoration are retained, but the seat-pitching has been reduced from 45in to 39in to increase capacity from 28 seats in the aft cabin to 36. Seats are close but not uncomfortable, particularly in view of the fact that passengers will be airborne, at the most, for only five hours. For use between Hawaii, Fiji, New Zealand and Australia, C.P.A.'s Comets will have a longer range than B.O.A.C.'s, since the 1A's fuel capacity is greater by 1,000 gallons. Water/methanol injection to the Ghosts permits a greater all-up weight—110,000 lb was the figure inscribed on CF-CUM, but the figure will probably be increased by another 5,000 lb when this method of thrust-augmentation is approved for use in all climates. Another take-off boost—the use of two 5,000 lb thrust Sprite rockets—was demonstrated by the prototype Comet. Although the Sprite has not been fitted to production Comets (if adopted, in fact, it is more likely to be for military purposes), commercial application of this compact unit would clearly occasion no alarm or discomfort to the passengers.

The debut of the beautiful Britannia was, of course, one of the big events of the show. The proportions of this 70-ton turboprop airliner seemed almost perfect from any aspect—in the air or on the ground, with its admirers dwarfed by the great 37ft-high fin and rudder, white-painted and bearing Speedbird and Union Jack. The superb finish of the airframe, particularly the leading edge of the 140ft wing drew praise from all sides, as indeed did Pegg's confident handling of the new airliner, which is remarkably manœuvrable for its size. The properties of the Britannia as a transport vehicle were well illustrated by a model in the static display showing a 93-seat layout with galley and toilet. Special seat attachments make it possible for this number to be reduced at short notice to 50 passengers for luxury oceanic travel or even to be increased to over 100 for short-stage high density work. The latest graphs show that 25,000 lb of payload can be carried over a still-air range of 4,000 miles, or 15,000 lb for some 5,300 miles.

Although not unexpected, the announcement that Handley Page, Ltd., had on the drawing board the largest jet airliner yet projected caused a considerable sensation on the first day of the show. Preliminary details of the H.P. 97, as it is designated, were published in *Flight* last week. It has since been intimated that work on a prototype will begin shortly, the aim being to produce an airliner ready for service within five years. The power units will probably be four Armstrong Siddeley Sapphires. The project was illustrated at the show by an impressive cutaway model of a double-deck fuselage with seats for 96 passengers. The model had only swept-back stubs for wings and tail unit, indicating that these parts of the design are subject to security regulations. The

The Percival P.56 "Provost" trainer with the Alvis Leonides Engine

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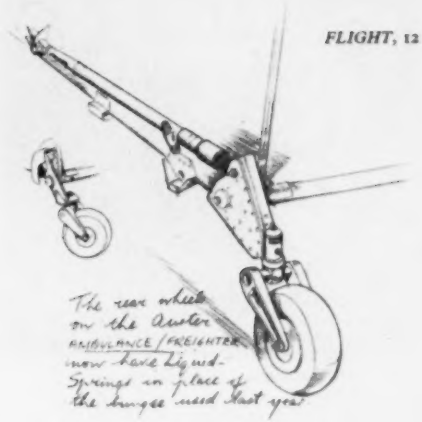
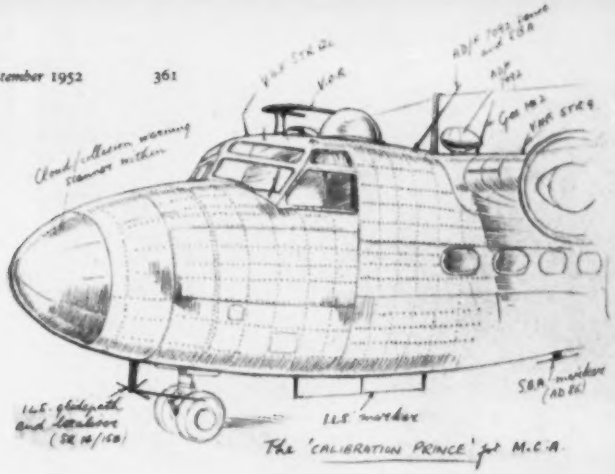
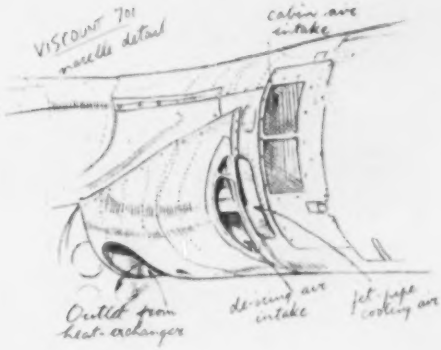




name of Handley Page has, of course, frequently appeared in references published abroad to new types of British bomber. The company is evidently determined to take an active share in developing Britain's present lead in the design of jet transports, and the H.P. 97 blends this ambition with the universal trend towards greater payload-per-aircraft.

Another important Farnborough-week announcement concerned the massive Blackburn Universal Freighter, for which an R.A.F. contract has at last been placed; it follows, almost automatically, that the manufacturers will also be able to take on production of three car-ferry versions for Silver City Airways, as forecast by a working model in the static exhibition. In this role, the bulky Blackburn will supplement Silver City's sturdy Bristol Freighters, a popular design shown this year, like the four-engined Marathon feederliner, in military form.

De Havilland's Heron and Dove, presented in the colours of overseas operators, served as reminders of the growing success of British aircraft in the overseas markets. The appearance of the first Viscount 701, which will lead B.E.A.'s regular fleet of 26 into inter-city service next year, indicated that production of these magnificent 40/53-seat medium-range airliners is well under way; visitors to Farnborough next year can expect to see one in the colours of an overseas operator—possibly Air France, who have ordered 12. The Prince and Sealand have already made their mark abroad and there seem good prospects for Scottish Aviation's 16-passenger Twin Pioneer, a model of which attracted great interest. An ingenious method of showing its potentialities on out-of-the-way routes was the plan of Prestwick Airport, with the Twin Pioneer's 100 yd landing area visible as a tiny square on the 2,300 yd main runway.



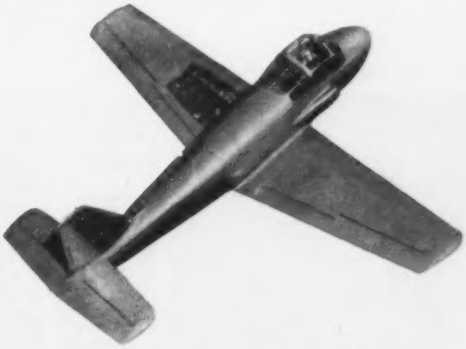
AROUND THE STATIC SHOW

The big marquee at Farnborough last week housed what must surely have been the greatest variety of aeronautical equipment ever gathered under one roof. Two hundred and thirteen stands were allocated—a record. It is our intention to concentrate here upon completely new equipment, or upon products of outstanding importance of which additional details are now publishable.

Engines.—Three large turbojets of contrasting outline were on view; Rolls-Royce's Avon, with its maximum diameter near the middle; Bristol's Olympus, with a trim 26in waist; and Armstrong Siddeley's Sapphire, the diameter of which stays fairly constant throughout its length.

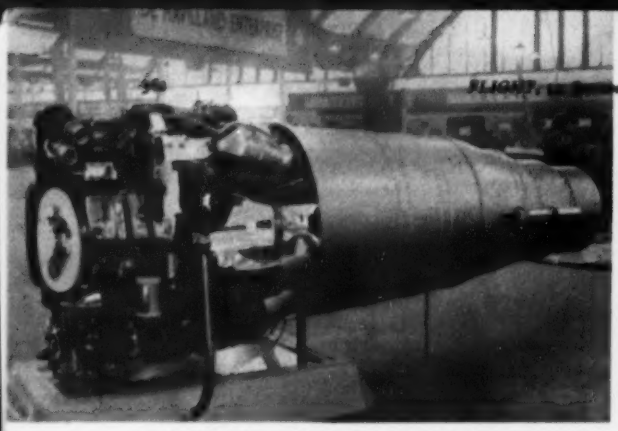
The Avon shown roughly corresponds to an RA 1. The entire engine has been prepared for display (from scrap parts) by Rolls-Royce—mainly their apprentices. This Avon was shown without any non-standard features, or blanking caps; but everything that may be said has already been said and it is probable that discussion of more advanced Avons will not be permitted until this time next year.

Holding a special place among turbojets by reason of its power, economy, control-response, and compactness, is the Olympus. Quite a number have now been built and running time is mounting rapidly; at the time of writing, airborne time has already reached 23 engine hours, and the present state of development suggests that this total should increase very rapidly. The engine displayed was fitted with a tailpipe cone of an almost spinner-like profile. The variable-incidence inlet guide vanes are unlikely to remain—the



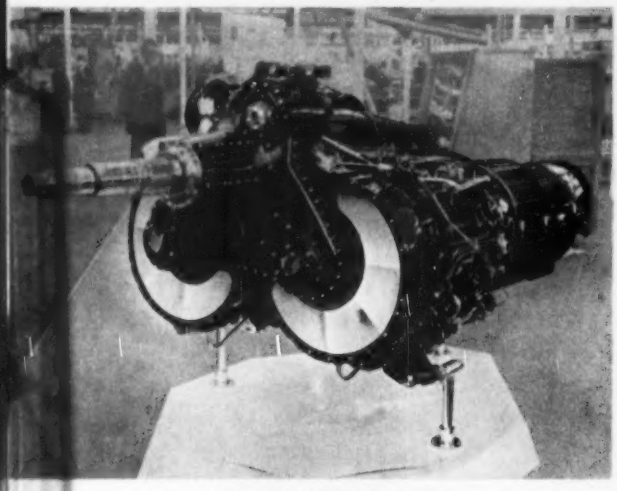
Model of projected jet-propelled Percival Provost development.

Below: model of Saunders-Roe project for a Sunderland replacement.



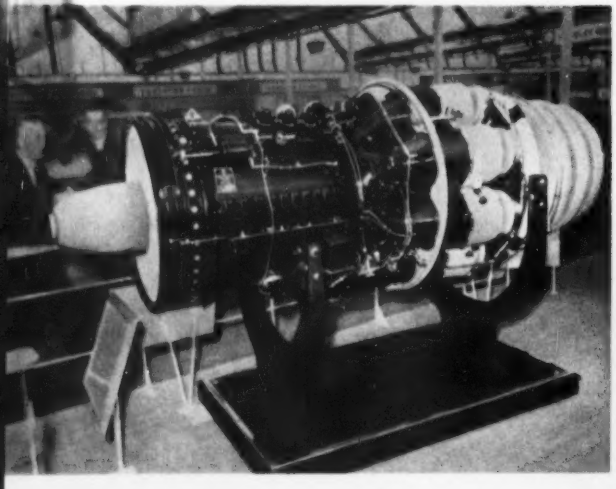
de Havilland Ghost, with D.H. two-position afterburner.

Alvis Leonides helicopter power plant.



Armstrong Siddeley Double Mamba.

Rolls-Royce Avon—for super-priority fighters and bombers.



FARNBOROUGH REVIEW . . .

present movement is provided for experimental purposes only.

The Sapphire on show was an ASSa 6 with a type-tested thrust of 8,300 lb at 8,300 r.p.m. An impressive Sapphire figure recently released is the cruising specific fuel consumption of 0.85 lb/hr/lb thrust. The ASSa 4 may also be named, but no details of this variant are yet available. Also on the Armstrong Siddeley stand was a Viper ASV 2 expendable turbojet; there is sure to be a big future for this diminutive engine, which had already been type-tested at a thrust in excess of the design rating of 1,575 lb. The Viper has also been cleared for piloted flight and its development for pilotless applications has been so successful that Armstrong Siddeleys suggest that "an alternative version may prove of interest as a utility engine for more conventional aircraft."

Napier's are quietly developing the basic Nomad conception into a first-class aircraft power plant—there have, too, been suggestions for applications in surface use. The same engine as last year is displayed, but the company hope that greatly developed types of Nomad may come a little into the open next year. It has been calculated that, by exclusive use of the Nomad, the B.O.A.C. fuel bill could be approximately halved, the specific consumption being the lowest of any aircraft engine (and the diesel oil costs only 1s. 2½d. per gallon). Recently proposed applications for the engine include the Blackburn Universal 2 and a new Saunders-Roe patrol flying boat.

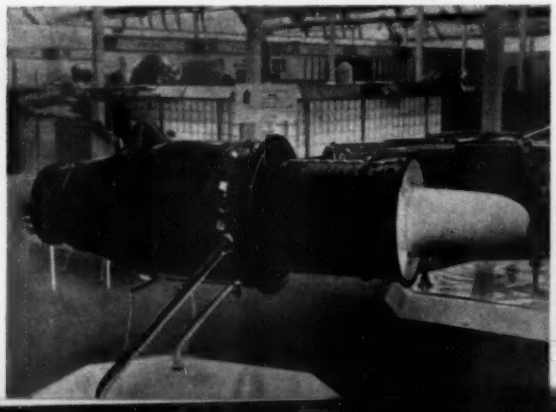
The Eland was dealt with *in extenso* in our last two issues, but it may be said in addition that the overall configuration of this well laid out turboprop was governed by the minimum drag envelope, based upon spinner diameter (6,000 size shaft) and air-intake requirements. Napiers state that the Eland is an entirely new design having no direct relationship to the Naiad or any other unit.

Alvis has now released preliminary details of the 14-cylinder, two-row Leonides Major. This promising engine uses standard Leonides cylinders, but the overall diameter has been reduced to the almost incredible figure of 38.9in. The designed maximum power is 870 h.p. and it is likely to be seen in many fixed- and rotary-wing aircraft; but Alvis cannot yet issue a statement regarding the "Major's" development or availability.

A most instructive engine was the de Havilland Ghost; the photograph above shows the actuator for the variable-tailpipe nozzle. The Sprite was also shown fully "opened up" and incorporates recent modifications which were not present on the similar model shown last year.

The Beta II rocket unit was displayed for the first time. Evolved by the R.A.E., and developed and produced by Faireys,

Armstrong Siddeley Viper expendable turbojet.



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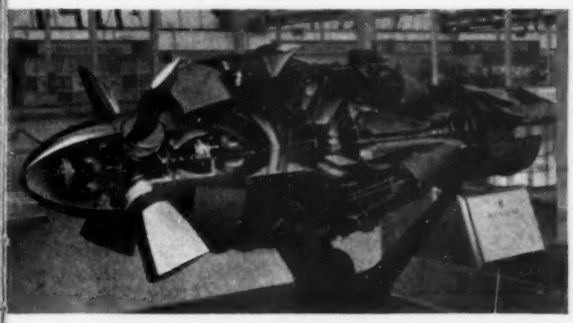


Rolls-Royce Dart power-plant for the Vickers Viscount.

this "hot" unit was designed to give 2,500 lb thrust for 40 seconds. Its immediate application is in the field of experimental models with unconventional shapes or control systems. The Beta II was shown on the M.o.S. stand, together with a range of components from high-speed centrifugal pumps for rocket units.

In a very different category is the Villiers "Picador" two-cylinder, four-stroke engine which has been developed to power expendable remote-controlled target aircraft. This neat little vee engine has a capacity of one litre and delivers 65-70 h.p. at 5,000 r.p.m., although up to 90 h.p. can be obtained without trouble. Fuel injection is used and the airscrew is driven at half crankshaft speed. The engine is going into production for the M.L. target, but if A.R.B. approval is forthcoming, it appears to have excellent possibilities as a unit for piloted light-aircraft designs.

Guided Missiles and Targets.—M. L. Aviation were showing an interesting target aircraft which, as related above, has been designed to take the Vincent two-cylinder Picador engine. Of conventional aircraft layout except for a butterfly tail, this target carries the designation U-120D and weighs 472 lb; the span is 12ft, and wing loading 25½ lb/sq ft. It is controlled by an automatic pilot which operates on the three-axis system, although the two-axis control is sufficient, with the butterfly tail, for complete stability in flight. Although only 5.3 gallons of fuel are carried, it is sufficient for a duration of 45 minutes; the maximum speed at sea level is 203 kt, and the service ceiling is 19,000ft. The target on view is finished in red and yellow and it is to go into production for various training and experimental purposes.

On the Bristol stand was shown an early version of a ramjet test vehicle. Much of the basic design-work was carried out by the R.A.E., but to Bristols goes the credit for the development and production. The diameter of the ramjet was restricted to 6in in order to keep down the test power requirements, but this small diameter has necessitated the provision of two power-plants. In addition, two cordite rockets boost the vehicle at launching, and the maximum speed is probably about 1,500 m.p.h.

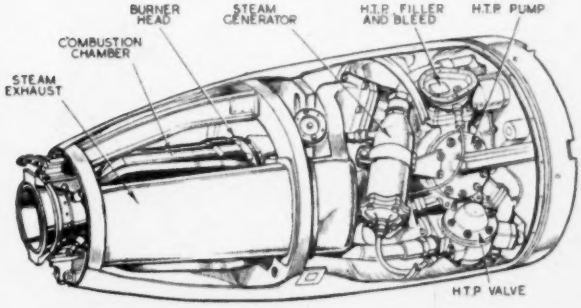
Components and Accessories.—Without doubt the most advanced airscrew yet made in this country is the 16ft-diameter design which the de Havilland Propeller Company have developed for the Britannia. This is the first production application of the hollow steel blade in this country. An example was shown on the company's stand and was seen to have approximately uniform chord throughout the blade, which ends in a square tip. The finish is excellent, particularly along the leading edge; the trailing edge appears as a welded joint about ¼in thick. Faireys have also developed a new airscrew, in a rather simpler field, which effects significant increases in the efficiency of small piston-engined installations; this efficient metal design was seen installed on a Bombardier on the Blackburn stand.

The Rotol stand, which last year housed a Double Mamba co-axial airscrew, this year featured an exhibition model of the Viscount airscrew. Shown fully sectioned, it has light alloy forged blades with integral electric elements de-icing on the leading edges and spinner. Rotols also displayed a range of gearbox drives for auxiliary services; one of these was mounted not on to the airframe direct, but on to an outsize electric generator; but this installation was for an aircraft whose identity cannot yet be revealed.

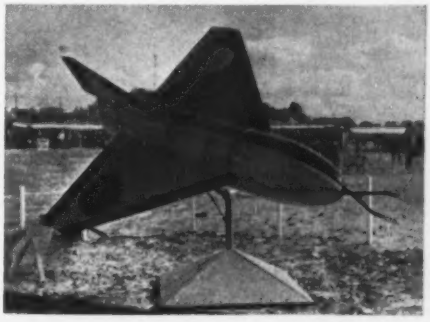
Last week brief details of the undercarriage exhibits were given, and sketches of four types of British bogie appear on the following page. A new g-restrictor was on view on the British Messier stand. This is a self-contained hydraulic circuit which imparts a load on the pilot's control column. It can be set to permit any required maximum acceleration and, if the pilot attempts to overload the aircraft, the restrictor prevents movement of the control column by means of a hydraulic jack.

Joseph Lucas (Gas Turbine Equipment), Ltd., were able to

Internal arrangement of Beta II rocket motor (M.o.S. stand).

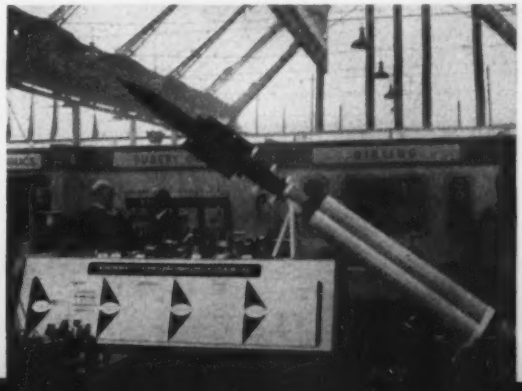


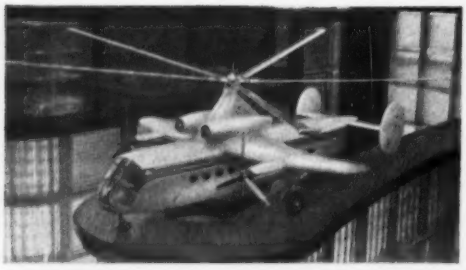
The Fairey pilotless twin-rocket-propelled research model.



Ramjet test vehicle, developed and produced by Bristol.

Supersonic experimental missile with boost unit, shown by the M.o.S.





The projected 40-seat Fairey Rotodyne, a development of the Gyrodyne, has two turboprops on the wings to provide forward thrust.

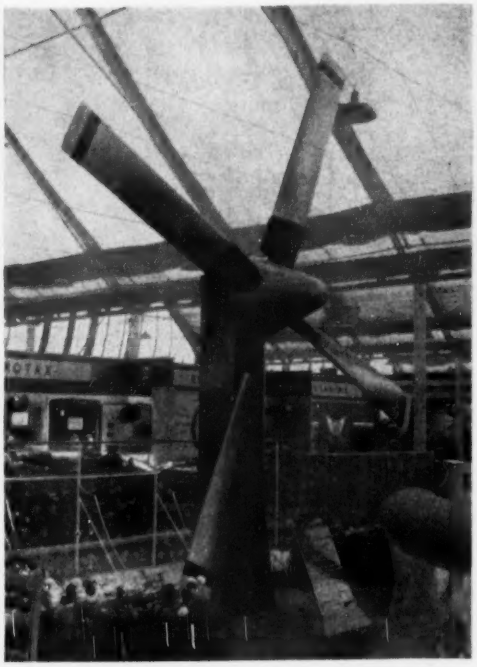
display a very varied and advanced range of fuel pumps, combustion equipment, de-icing heaters and hydraulic control systems. Liquid-fuel turbine-starting units are making their appearance, and such items were exhibited by Plessey and Rotax. Williamsons exhibited the GX 90 gun camera which weighs no more than 4¼ lb. This camera can take up to 32 frames/sec on 16 mm film.

On the double stand of Venner and Venner Accumulators was a model coder for sending the call-sign of locator beacons. Another interesting flying aid was the lightweight airfield radar equipment developed by Cossor. A complete installation can be provided weighing no more than about 1,200 lb, and it is sufficiently rugged for installation in a vehicle. This equipment has a range of about 20 miles and is certain to prove very useful for applications where more elaborate radar installations are not justified.

Teddington Controls, Ltd., showed representative items of equipment of their manufacture which are used in the Britannia, whereas the stand of Kelvin and Hughes and Smiths Instruments featured a representation of the Comet cockpit in which many of their instruments are installed. Packaging and equipment protection was featured by R. A. Brand and Co., who showed examples of their well-known Cocooning and Texicooning sprayed envelopes. Halls displayed two models of the Brabazon, one of which was protected by their liquid envelope, and finally, Lep Air Transport showed a Godfrey pressure-cabin-testing trolley which had been carefully prepared for tropical transit inside a large wooden case.

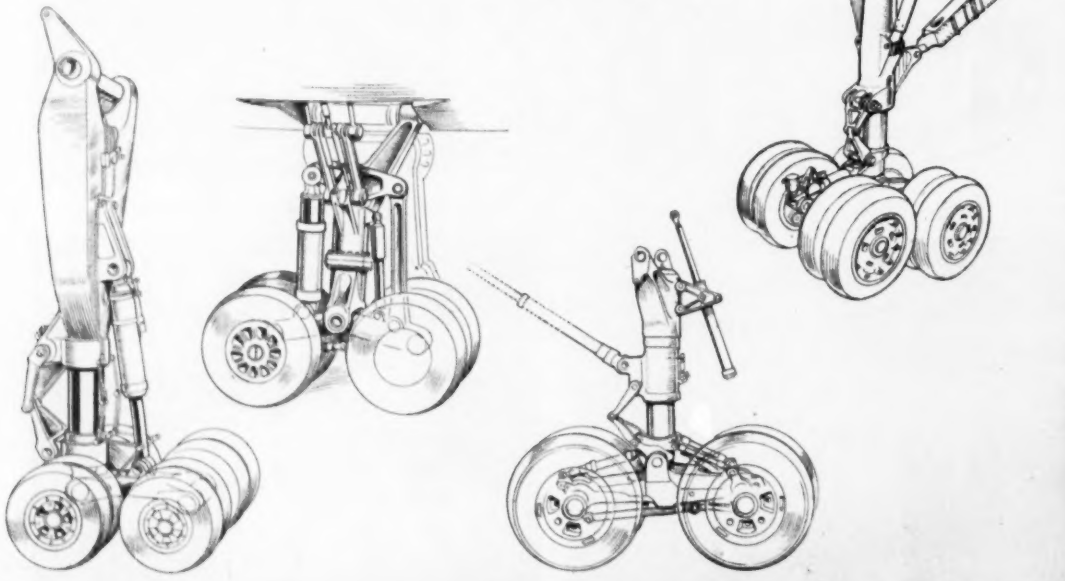
Dowty Equipment, Ltd., showed—in addition to their Sea Hawk and Avro 698 undercarriages—several new items recently added to their range of fuel-system equipment. Hymatic exhibited an anti-g valve, but this unit is, unlike that from Messier, designed for incorporation in the inflation circuits of aircrew g-suits.

We hope to make further reference to Static Show exhibits next week.



First hollow-steel-blade airscrew in production in this country—the 16ft example developed by de Havilland Propellers for the Bristol Britannia.

Four contrasting types of multi-wheel undercarriages seen at Farnborough. Left to right: Dowty eight-wheel scooter-type bogie as fitted to the Avro 698; the four-wheel bogie of the Comet 1A; British Messier four-wheeler for the Britannia; and an impressive eight-wheel bogie by Electro-hydraulics.



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OPERATION CUMULUS

Sailplanes Assist a Co-operative Investigation of Up-currents and Associated Phenomena

The T.21 during the tests. In the cockpit is Mr. F. Irving and alongside is Dr. Paul McCready from America.

SOME valuable information about cumulus clouds, and about the "thermals" leading up to them, was obtained by an expedition to Cranfield during the first two weeks in August. This full-scale research work was organized by the Imperial College of Science and Technology (Mr. F. Ludlam and Dr. R. S. Scorer of the Department of Meteorology, and Mr. F. Irving of the Department of Aeronautics) and took place at the College of Aeronautics, Cranfield, Bedfordshire.

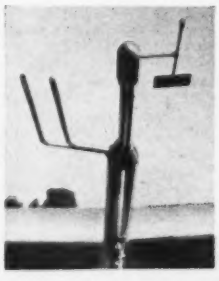
The main aim of the work was to obtain information on the size and strength of thermal up-currents: how they are formed near the ground and how they rise to form cumulus and cumulo-nimbus (thunder) clouds. This information, in addition to being of obvious value to glider pilots who use these currents, is of interest to other aviators, since it affects smoothness of flight, together with icing, thunderstorm-growth and rain formation.

On the ground, meteorological students from Imperial College measured the air pressure, temperature and humidity, and determined the wind speed and direction at various heights by theodolite-tracking of balloons released from the ground. Photographs were also taken of cloud development.

In the air, help was given by the Meteorological Research Flight, whose Hastings from Farnborough made observations of the size and structure of clouds in the vicinity, and by a Cambridge University Air Squadron Anson with a meteorologist from the University Department of Physics. The aircraft chosen to fly in the thermal up-currents were gliders, by reason of their ability to fly slowly and, if necessary, circle tightly in these thermals.

One of the gliders, a Slingsby T.21 two-seater owned by Imperial College Department of Aeronautics, was flown by Mr. F. Irving and carried in the passenger seat a large automatic observer to record the motion of the aircraft as it flew through the thermals. Two Olympia single-seat gliders also took part; they were flown by Mr. P. Blanchard and Mr. A. H. Yates and carried sensitive air thermometers and barographs in addition to the normal flying instruments. The gliders were towed by a Fieseler Storch loaned for the occasion by the Royal Aircraft Establishment and flown by S/L. J. Sowrey, A.F.C.

The T.21 glider was usually towed to near cloud-base and, after casting off the tow, was flown on steady courses back and forth near the airfield. Its path was determined from the readings of theodolites at each end of a mile-long base-line while, in the glider, instruments were photographed every two seconds; they indicated altitude, airspeed, rate of descent, rate of pitch, the attitude of the glider to the horizon (by a graduated artificial horizon), the attitude of the glider to the flight-path (by a wind vane mounted on a 12-foot pole projecting from the nose of the glider) and air temperature (from a twenty-junction thermocouple thermometer). The analysis of the films obtained will not be completed for some time, but they should provide information about the distribution of up-currents and of air temperature in the neighbourhood of a thermal. It is hoped, too, that some light may be thrown on the phenomenon of the increase of air speed on entering a thermal, which many glider pilots have noticed. The two Olympias were flown in thermals and in cumulus and cu-nim. clouds to obtain and record values of air temperatures and rates of climb therein.



The T.21's nose-boom carried an A.S.I. pitot head, and a wind-vane to indicate angle of attack.

The control and synchronization of the observations of this team of observers was managed by radio and telephone. The aircraft were in touch with Air Traffic Control; the two-seater glider could talk direct to the station at the top of the College water tower by Pye walkie-talkie radio, while the observers at the ends of the various base-lines on the airfield could converse by radio or by means of the airfield telephone circuit.

The weather had no respect even for such an important assembly of meteorologists. Heavy cu-nim. clouds appeared during the first week but little sun was able to reach the ground, so thermals were weak at low altitudes. On Wednesday, August 6th, the day on which several inches of exceptionally heavy rain fell in London suburbs, an Olympia flown by A. H. Yates managed to enter one of these clouds at 2,500ft and climbed inside the cloud to 8,500ft in rain and hail before emerging from the side. He was able to regain the airfield through heavy rain and obtained some useful temperature-readings inside and outside the cloud.

Meanwhile a neighbouring cloud had been the subject of a rain-making exercise. The Cambridge University Anson had been supplied with several pounds of common salt ground to the fineness of french chalk. On the directions of Mr. Ludlam, the salt was jettisoned just underneath this active cloud, from which no rain had yet fallen. Calculations had suggested that in about twenty minutes the salt particles, having been drawn up into the cloud by convection, would produce rain. The rain which descended exactly twenty minutes later certainly had extremely large drops and was probably the heaviest ever experienced locally. The rain-makers were jubilant and reverent approaches were made by both local gardeners and cricketers (with contradictory requests). However, when the radio announced sensational rainfalls all over the country—without salt—claims became more modest.

The argument is that the salt particles grow by attracting water vapour to themselves. They then collect other droplets by collision until they become large enough to fall out of the cloud as rain. This process is believed to be the explanation of the rain which falls from coastline clouds which do not reach freezing level, the salt in this case coming from sea spray. It is the generally accepted theory that, further inland, ice crystals are needed to start the formation of the droplets.

Those taking part in the research were accommodated at the College of Aeronautics and, inevitably, there were long discussions on the problems being investigated. Among the visitors were Professor O. G. Sutton, F.R.S., and Dr. Railston of the Military College of Science, who spoke about laboratory experiments they were conducting on temperature distributions in columns of hot air rising from a heated gauze in a still room.

Theory and experiment both throw light on the way in which the air above a heated surface (such as the ground) becomes unstable and rises, but the conditions in the thermal after it has risen more than a few feet are still unknown. The main difference of opinion is between those who regard thermals as bubbles of hot air rising through cooler air and those who think of the thermal as being more like a chimney (the argument often ends by agreement that a long bubble is rather like a short chimney).

Another visitor to Cranfield was the American meteorologist and glider pilot, Dr. Paul McCready, from the California Institute of Technology and, since he has extensive experience of thermal flying, his co-operation was very welcome.

Altogether, this effort by research workers from three universities, using equipment provided by three Ministries, was a notable feat of organization.

Our American Correspondent Reports . . .

AS forecast in *Flight* of June 20th, the Douglas Aircraft Company has now released a preliminary specification for its proposed jet transport. There are several points of interest in the announcement. The all-up weight of the long-range version is greater than was expected, and the thrust given for the Pratt and Whitney J-57s indicates that the engine manufacturers are expecting a lot of stretch from this engine during the next six years. Some people also feel that Douglas have been over-brave in quoting today a price of three million dollars when production costs may have gone up even more by 1958. For their competitors, one of the most important statements is that of the estimated date of the first flight of the production aircraft. (Whether No. 1 machine will be No. 1 production aircraft or a prototype, is not known.) But Douglas are a pretty realistic firm and it would not be surprising if this time were improved upon; maybe the aircraft will be flying by the autumn of 1957.

But the most noteworthy point is that, despite all the back-and-forthing and chat and discussion that has gone on in and out of Congress and the aircraft industry about manufacturing costs and the necessity for government assistance, a company of such stature as Douglas have apparently gone ahead and decided to finance the development and production themselves (which does not mean that if in the meantime some sort of Government subsidy comes along it wouldn't be considered!)

The announcement will also be a shot in the arm for both the industry and the American public—who have not taken too kindly to all the recent statements and rumours about the American operators having to buy Comets. It is also likely to produce reactions from Convair, Boeing and Lockheed. For they will have to keep in the picture, and similar announcements should come along from them before the end of this year. (The last-named company is rumoured to have abandoned its "four jets behind the cabin" configuration and to be thinking of something quite different.) But the publication of any plans will not only be intended to keep the publicity picture bright. They will be designed as part of a holding operation aimed at keeping operators on the American hook. As it is unlikely that the DC-8—or any other American jet transport—can be ready for operations before 1958 or 1959, it will be a battle between those who can offer an-aeroplane-that-is and those who are selling an-aeroplane-to-be. And by that time the Comet III (or whatever it is to be called) should be in the former category.

• • •

ON August 1st, *Flight* mentioned an American Aircraft Production Board report which had suggested some pretty drastic reductions in the multiplicity of types of aircraft now being produced for the Armed Services here. One hears that this was more of an appreciation of the position, produced by a section of the A.P.B. staff for consideration, than an actual recommendation. It included engines as well as aircraft. But whatever it was, it produced some immediate, violent and understandable reactions from the aircraft industry as well as from the Air Force and Navy.

There is perhaps some merit in the suggestion that it would be more efficient from a purely production point of view to turn out fewer types, and more of the chosen few. But it is argued that to do so under a plan which would call for drastic production changes, right in the middle of a re-armament programme, is another matter, to say nothing of the chaos it would cause to the design staffs, production lines and financial situations of those firms whose types were not chosen and who would have to switch to another type.

Many of the critics pointed out that this was a "civilian production" appreciation, rather than one geared to either the practicalities of airframe and engine development or a balanced air strength. In the engine section alone the suggestion that the Allison T-40 should now be introduced (gradually to replace the Wright R-3350 and Pratt and Whitney R-4360 reciprocating engines) made it look as though the difficulties surrounding the normal development of turboprops was being underestimated. It is, nevertheless, a suggestion, the outcome of which is of enormous importance both to the aircraft industry and the services (although it is the writer's feeling that it will not survive).

• • •

THE silly season of July and August generally brings a crop of flying-saucer stories. This year of high temperatures and extreme humidity has been no exception. In the late spring the already active imagination of the American public was excited by an article in *Life* which suggested that, although inexplicable, there was, nevertheless, something to all the saucer stories. Then more strange sightings in the South-western States and by airline pilots, and some unexplained blips on the Washington Airport radar, started things up with a vengeance. It got so bad that the U.S. Air Force had to have a high-level Press conference to try to bring things back into perspective. Some of the papers were asking why, if these "somethings" were showing on the radar screens of the country, the interceptor fighters, of which they'd heard so much, didn't go and shoot those "somethings" down. At one point fighters were apparently sent up and, not surprisingly, found nothing—an abortive sortie which only helped to convince the public that there was "something" there.

For a time everybody seemed to forget that radar has always had a habit of registering "somethings"—and, as for the visual sightings, the scientists admitted that certain types of temperature inversion might, under most advantageous circumstances, give a reflection of ground-based lights, having their origin a considerable distance from the observer, but which could look as though they were airborne. Meteors, meteorological balloons, high-flying aircraft, paper carried upwards on strong up-currents, and even pure and simple imagination, have probably added to the toll.

• • •

THE August 11th issue of *Aviation Week* reported the Madrid World Gliding Championships under the heading "U.S. Gliders: No Support, No Wins." The article went on to say, "Reason for poor showing was lack of ground facilities. With no backing from government or industries, the team were without towing vehicles, radios, and repair facilities, and had no meteorologist. Most other nations were backed heavily by their governments and some teams were military units."

The writer hasn't the faintest idea what backing the British team had, and it may well have been limited to a Bank of England concession on the currency-control regulations. Nevertheless, the implied suggestion remains that the only reason the American team didn't do better was because the system of free enterprise couldn't compete with the superior organization of government backed units!

Unfortunately, this same explanation was given in a report on the meeting which appeared in one of the big national magazines here—a magazine that prides itself on its snappy methods of reporting and description. It's a pity that in their search for an excuse to explain American failure to live up to their expected standards, the papers concerned lumped everyone into the same category and did not bother to check on the accuracy of their statements as far as our own team was concerned.

Also, there is something illogical in a state of mind that implies that free enterprise must be better than anything which has government assistance, and in the same breath, suggests that American failure is due to the superiority of a government-assisted competition. As somebody said the other day about a well-known aviation character, whose statements are often trimmed for the winds of opportunity and often strangely contradictory: "every time he goes down the street he meets himself coming the other way."

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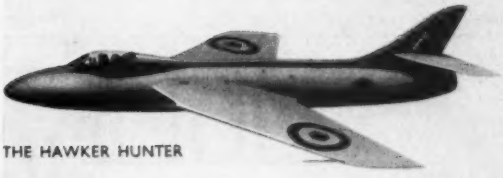
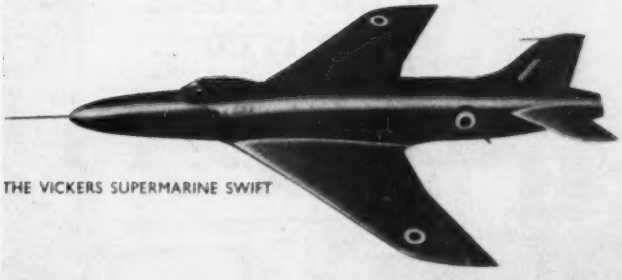


THE HAWKER HUNTER

THE GLOSTER JAVELIN



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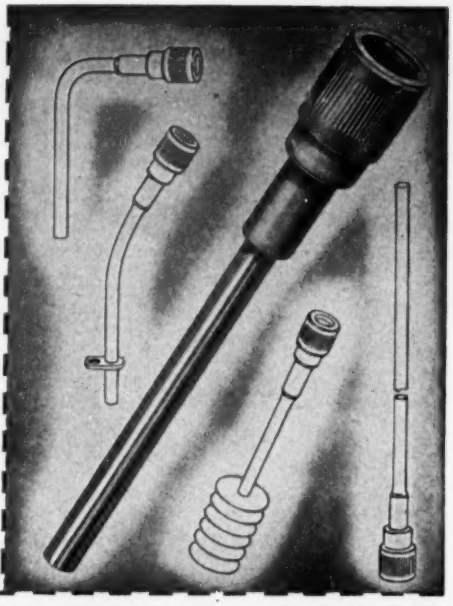

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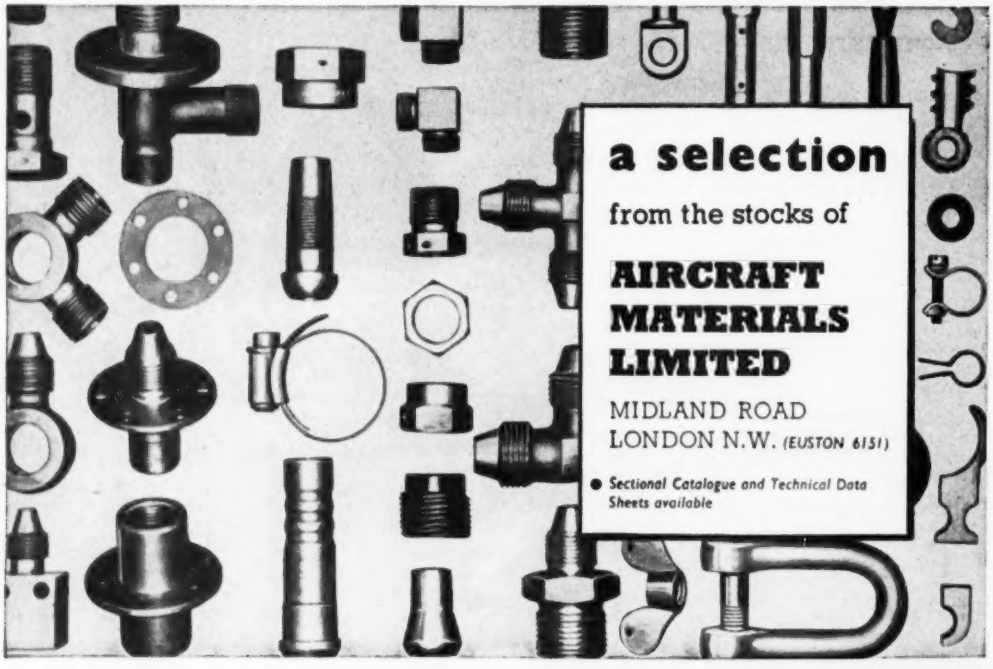

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CIVIL AVIATION

"Flight" photograph

AN M.C.A. PRINCE—one of three Series IIIBs ordered for radar calibration purposes—is the subject of this lively impression. A sketch illustrating its numerous antennae and aerials will be found on page 361.

INDIAN-OCEAN SERVICE OPENED

THE reputation of Qantas Empire Airways as long-range operators has been further enhanced by the inauguration of their 8,665-mile service linking Sydney and Johannesburg *via* Perth, the Cocos Islands and Mauritius.

The first scheduled flight was completed on September 4th, when the silver-and-maroon Constellation, VH-EAD *Charles Kingsford Smith*, landed at Palmietfontein Airport after a successful 3½-day flight. She was under the command of Captain K. G. Jackson, senior captain of Qantas, and among her 28 passengers were Mr. Hubert Anthony, the Australian Minister of Civil Aviation, and Mrs. Anthony, Mr. W. Hudson Fysh, the chairman and managing director of Qantas, Captain R. B. Tapp, line manager, and a party of Australian journalists. The return flight began on Saturday, September 6th, and ended on Tuesday.

DEVELOPING KAI TAK

THE Hong Kong Government has appointed a London firm of civil engineers (Scott and Wilson, Ltd., who are experienced in airport work) to study methods of implementing recent M.C.A. recommendations on the development of Kai Tak Airport. The introduction of the Comet and the advent of the Britannia have accentuated the urgency of making Kai Tak suitable for safe and regular operation of all types of aircraft—in service or likely to enter service in the foreseeable future. Two representatives of the firm, Dr. G. Wilson and Mr. H. Grace, will leave for Hong Kong shortly to study on the spot both general and detailed aspects of the Kai Tak development scheme.

COLONIAL CONFERENCE OPENS

THIRTY or more delegates, representing some 40 colonial territories, attended the opening in London last Monday of the second Colonial Civil Aviation Conference. The Earl of Munster, Parliamentary Under-Secretary of State for the Colonies, who opened the conference, said that the production of jet transports would result in bringing all parts of the Commonwealth and Empire into closer touch with the Mother Country; ministers and permanent officials would be able to undertake more frequent visits overseas to discuss matters of importance to all the territories. The conference is reviewing progress in civil aviation since its first meeting in 1947, and various problems arising from further developments are also being discussed. Another subject on the agenda is the recent change in Governmental civil aviation policy. Discussions were expected to last about a week.

A. CDRE. GRIFFITH POWELL is in the news at the moment—not only as the managing director of Silver City Airways (who have announced a £1m order for three Blackburn Universals for their car-ferry services), but as the newly elected president of the International Federation of Independent Air Transport. The Federation's immediate aim is to resist "the current trend of imposing taxes on many aspects of air transport"—passenger landing tax and petrol tax being notable examples.

NEWS FROM NEW ZEALAND

IN the year ended March 31st, Tasman Empire Airways had its most successful period of operation. The Corporation earned a net profit of nearly £32,000, although the waterfront strike of early 1951 was partly responsible for the high revenue. Nearly 40,000 people crossed the Tasman by air during the year. Sir Leonard Isitt, T.E.A.'s chairman, has said that the opening of new services—between Christchurch and Melbourne, and from Suva to the Cook Islands and Tahiti—has almost doubled the company's route mileage. Sir Leonard predicted that the Coral Route to Tahiti would quickly become important to New Zealand, especially as an earner of dollars. The next main development would be the opening of a service by Solent flying-boats to Samoa.

A great increase in air travel, air freight, and other air services in New Zealand is noted in the annual report of the Air Department. During the last year, passenger traffic on the country's internal air services rose by 27 per cent, air freight by 64 per cent, and the number of passengers on other services by 40 per cent.

CORPORATIONS' GOOD NEWS

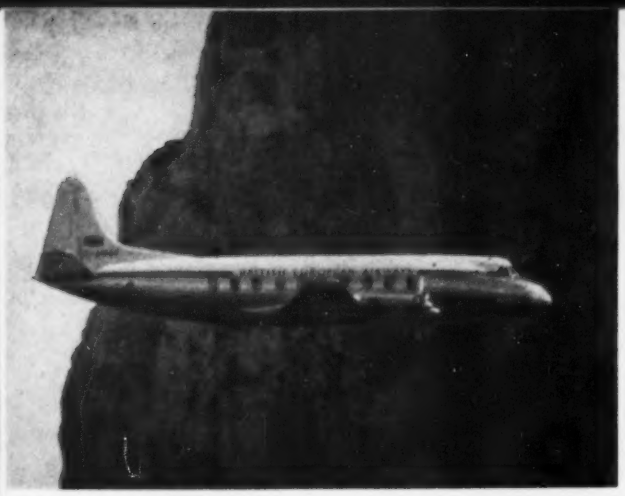
IN a speech made at the week-end, Sir Miles Thomas is reported to have said that B.O.A.C. was now making a constant profit month by month. It would shortly be announced, he forecast, that the Corporation's financial result for the past year was a gross profit of over £1m. By the time dividends on publicly-held stocks had been paid there would be a surplus of £250,000—"a welcome change from the overall deficit of £8m just two years ago."

B.E.A.'s chief executive, Mr. Peter Masefield, has also announced some encouraging figures. During July, B.E.A. carried an overall number of passengers of 176,891, the revenue for the month being just on £1.5m. Compared with July, 1951, passenger-traffic for the month had increased by 23 per cent—and the profit was some 12 per cent higher, despite increased costs. When the revenue was there they need have no economic fears; the trouble was the winter. Figures published in the *B.E.A. Magazine* give some interesting "break-even" load factors for various routes: on the London-Jersey route, for example, an overall load factor of 76 per cent was needed to break even over the year ended June 30th (the factor achieved was 72 per cent), whereas the break-even factor for the month of June was only 50 per cent (factor achieved, 73 per cent). Referring to the much-vexed question of the Scottish services, Mr. Masefield has put on record his "firm belief that we in B.E.A. can provide better services, cheaper, and with more 'know-how' than anybody else."

RICKENBACKER: A HATFIELD POSTSCRIPT

LAST week, it will be remembered, we reported an interview with Capt. Eddie Rickenbacker before he returned to the United States. He declared that if the Comet III specification tied up with the requirements of Eastern Air Lines and—equally important—delivery dates were reasonable, he would place an order for at least 35 aircraft of this type. He gave 1955-56 as a "reasonable" date, but implied that 1957 would not be too late. That the manufacturers may, in fact, be able to meet his requirements (or call his bluff, as the case may be) is indicated by the following statement. It was issued by de Havillands on Friday:—

"Captain Rickenbacker's account of the talks which he has had with de Havillands give a true picture of the situation. For the time being there is nothing which can be added about the discussions, which are to continue. The time taken to produce the Series III Comet is governed in the first place not by the production problems but by the time taken to develop a new type. This



COMING ROUND THE MOUNTAIN—or, to be strictly accurate, the Rock of Gibraltar. The Vickers Viscount 700 provided this striking impression during the development flight reported below.

CIVIL AVIATION . . .

cannot be accelerated beyond a certain point. De Havilland production plans envisage the building of six Series III Comets in 1956, followed by forty to fifty in 1957, and a further seventy in 1958. These plans are flexible and are based on today's estimate of the potential world market. A proportion of this output would be available for U.S. companies. As already announced, de Havillands can promise delivery of fifty Series II Comets in 1955, in addition to those already ordered, if orders are forthcoming immediately."

CHARTER NOTES

FOR the seven days ended September 7th, traffic returns for the commercial flights of Britain's independent air-transport operators were the best in several weeks. Excluding trooping flights, the companies' aircraft completed 85,000 miles of revenue flying—45,000 during freight flights and the remaining 40,000 on passenger trips. About 800 passengers and 365 tons of freight were carried on some 92 flights. Most of the revenue was derived from long-distance freight trips to the Far and Middle East and to South Africa and Canada, accounting for about 58 per cent of the mileage flown. About 24 per cent of the total distance was covered on freight journeys between Berlin and Hamburg; short-range passenger flights made up the remainder.

Dakotas were in greatest demand, completing over 40,000 miles, or nearly 50 per cent of the total. Yorks flew about 28,502 miles and Bristol 170s about 16,000 miles. Flying time for the week is estimated at 520 hours and the probable resultant revenue at £34,000. Eagle and Crewsair were busy on trooping work almost exclusively and their Yorks and Vikings were not generally available for charter. However, one of Eagle's newly converted Dakotas did fly 28 passengers to Lusaka in Northern Rhodesia for Lep, and returned to London with a similar load.

Skyways Yorks flew 42 passengers to Madrid, and took 30 seamen to Gander by means of the northern route through Reykjavik. Another Skyways York, under charter to K.L.M., flew a consignment of mixed freight to Bangkok.

Silver City's Bristol 170s made two trips from Berlin to Vienna with loads of theatrical equipment. These were short-notice flights made only a few hours before a stage production was due to open in Vienna. Three Connaught racing cars, on their way to the Italian Grand Prix, were flown from Lympne to Milan in two aircraft, together with 14 passengers and a load of spares and equipment. On the return trip the 170s brought back 9,000 lb of chemicals. During the week-end a 170 went out to Bilbao and returned to Blackbushe with 36 seamen. On the Berlin-Hamburg ferry the Bristols completed 25 round trips. Air Charters' Yorks, on the same run, made 35 round flights.

A Scottish Airlines Dakota, which had flown to Dukhan a week earlier, returned to this country with a mixed load of freight and passengers, and another Dakota of the same airline flew 24 passengers from Paris to Dublin. Another Dakota trip to the Middle East was made by a Fairey Aviation machine, which flew consignments of freight each way between London and M'panda, in Kenya. B.K.S. Aero Charter took 28 passengers to Johannesburg and 32 passengers each way between Southend and Basle, also in Dakotas. Aircraft of the same type operated by Air Transport (Charter) (C.I.), Ltd., flew twice to Bilbao with 32 passengers each way for the Y.M.C.A., and once, again with 32 passengers each way, to Innsbruck and Salzburg. A similar flight was made to Basle.

Most of the tourist and student flights to Basle, Salzburg, Copenhagen, and Paris, which several of the independent companies have been making this summer, have now come to an end, releasing more Dakotas for other work.

ANOTHER VISCOUNT CUSTOMER

LESS than four months ago Mr. G. R. McGregor, president of Trans-Canada Air Lines, expressed in a message to *Flight* his company's opinion that "the development of both turboprop and turbojet engines has not yet reached a point where an airline can embark with economic confidence on a major programme of fleet replacement with aircraft having one or other of the new types of power." But British progress with new airliners and a world-wide increase in airline traffic are causing many operators to reconsider conservative policies of this kind. Mr. McGregor, in fact, announced during the S.B.A.C. show that he was seriously considering the Viscount for possible use on the North American domestic routes, which are at present operated by North Stars and DC-3s. He said that traffic in Canada was growing so rapidly that T.C.A. would have to order a number of aircraft before the end of the year for delivery in 1954.

This company, it will be remembered, recently announced an order for eight Super Constellations, which will be used on the long-range routes—to Europe, Bermuda and the Caribbean.

Orders placed so far for the Viscount total 48 aircraft—26 for B.E.A., 12 for Air France, four for Aer Lingus and six for Trans-Australian Air Lines. The first of the 48 production Viscounts—a Series 701 for B.E.A.—made its appearance at Farnborough last week. Meanwhile B.E.A. have been continuing a series of special flights with the Series 700 prototype. On August 25-26th it flew to Cyprus and back, and on August 28th it visited Gibraltar, returning to London Airport the following day. Its pilot on the Gibraltar trip was Capt. A. S. Johnson, who is in charge of the Dart Development Unit; the co-pilot was Capt. "Dicky" Eymer (the first pilot to have his commercial licence endorsed for a turboprop type). Mr. Jauncy of B.E.A.'s project and development branch headed a seven-man team which checked performance and investigated the technique required for operating the Viscount in warm climates. Other specialists studied humidity, cabin pressurization, route services, movements and catering. Several Vickers representatives were aboard and two Rolls-Royce technicians watched the behaviour of the four Dart turboprops.

En route from Madrid to Gibraltar, the Viscount handled well despite cu-nim turbulence which at times pushed the 50,000 lb aircraft up at a rate of 2,000 ft/min. Severe hail, thunder and lightning were also encountered, and it was found at Gibraltar that hailstones had made considerable dents in the wing-fillets.

B.E.A. expect to make several more development flights with the Viscount during the next few weeks. A hint that this type may play a part in the coming re-birth of German civil aviation is given by the news that the 700 prototype will leave Britain on September 23rd for a tour of Germany. Several demonstration flights will be given in German cities.

THE WAY AHEAD: Mr. Symons, of B.E.A.'s Project and Development Branch, checked the performance of the Decca Navigator and Flight Log during the Viscount 700 flight to Gibraltar (see above).

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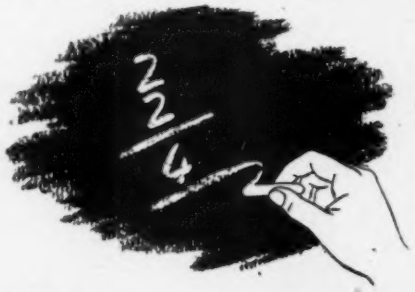

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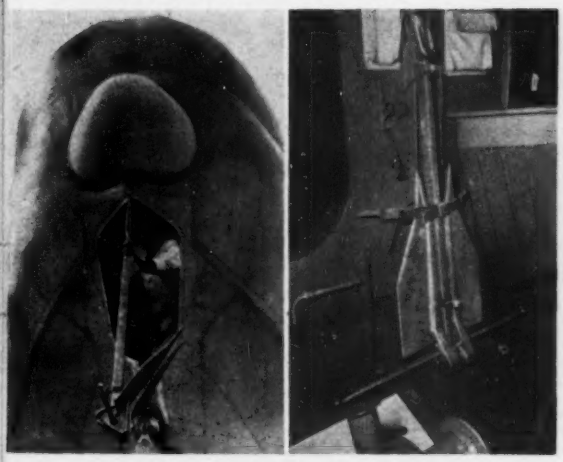


NAUTICAL CHOCK: In marine aircraft provision must be made for items which find no place in landplanes—for instance, an anchor. These two views show how the 100-lb anchor of the Saunders-Roe Princess is used from the nose-hatch, and how it is compactly stowed. Of the Danforth folding type familiar to yachtsmen, it has great holding-power. The protuberance seen above the hatch houses cloud-and-collision-warning radar.

BREVITIES

REPORTS that Pan American Airways had decided to buy Comets were denied last week by Mr. H. R. Harris, vice president of the company's Atlantic Division. He said that Pan Am had not yet completed its study of proposals for jet airliners submitted by both British and American companies.

* * *

Sabena opened on September 1st a thrice-weekly Dakota service between Brussels and Findel, Luxemburg. The new service represents the first air connection between the two capitals since 1947.

* * *

When Captain Alistair Majendie landed at London Airport on August 26th after a proving flight to Singapore, he became, according to B.O.A.C., the first man in the world to fly a quarter of a million miles in Comets. Majendie, who is Flight Captain of the B.O.A.C. Comet fleet, has commanded only one scheduled Comet service—the inaugural flight to Johannesburg on August 2nd.

* * *

Lockheeds report that every Super Constellation delivered so far has weighed less than the specified figure—by as much as 942 lb in one case. On average, the aircraft have been coming off the assembly lines 650 lb under weight; this figure, according to the company, represents £32,000 extra revenue per year.

* * *

During July there were 25,850 movements at U.K. airports, 9.9 per cent more than in July 1951. The number of passengers was 414,224, an increase of 15.1 per cent, but the amount of freight on- and off-loaded (4,416 short tons) decreased by the same proportion. Percentage increases in passenger traffic at London, Northolt, Prestwick and Ringway were respectively: 5.1, 10, 43.6 and 38.9.

* * *

Steady expansion is reflected in K.L.M.'s traffic figures for the first half of this year. The total revenue during this period was £11.8m, compared with £10.3m during the corresponding period of 1951. The load factor went up by one per cent to 67.8 per cent.

* * *

B.E.A. and Air France will introduce cut-fare services on the London-Paris route after October 1st. A single ticket will cost £6 10s; return fares will be £11 14s by day and £9 15s by off-peak flights. The B.E.A. services will be operated with the newly converted *Admiral*-class 38-seat Vikings, and Air France will use 55-seat DC-4s.

* * *

United Air Lines and Continental Air Lines are discussing the possibility of an interchange agreement which would result in through services by DC-6s between Seattle, Portland, Denver (the proposed interchange point), Wichita and Tulsa. If agreement is reached the companies will file an application for the service with the Civil Aeronautics Board.

* * *

Pilgrim flights to Jeddah (the airport for Mecca) by the DC-3s of Aden Airways carried the record number of 4,367 Moslems. The pilgrims were all taken to Mecca between July 27th and August 28th; return flights were due to begin last Sunday.

* * *

Increased use of Comet 1s on African routes may be a result of the talks held recently in London between B.O.A.C., South African Airways and Central African Airways. The meeting, under the chairmanship of Sir Miles Thomas, was held with a view to developing an improved and cheaper pattern of air services over the routes covered by the three companies.

THE VINTAGE RALLY

AS we briefly recorded last week, there was a leisurely atmosphere at White Waltham on August 31st—befitting, indeed, a flying meeting sponsored by the Vintage Aeroplane Club. Noticeable arrivals during the morning included those of the Praga G-AEUT, the Hawker Cygnet G-EBMB (by road), the Hawker circus (Hart, Tomtit, Rapide, and Hurricane) and the Gladiator G-AMRK.

Winners of the early afternoon contests were Capt. Ron Gillman (Avian), spot-landing; and W/C. Pike (Cirrus Moth), supply-dropping (peaceful flourbag equivalent of the militaristic "bomb-dropping"). The hedge-hopping contest was cancelled ("We have no hedge," explained David Ogilvy, the club's secretary), whereupon Miss Phyl Weir demonstrated the shortest distance between a Club Cadet over the airfield at 2,000ft and a pint of beer on the ground, by jumping—with parachute—out of the former.

The Hart-Gladiator dog-fight was followed by the formation competition, won with a polished demonstration by the Hawker team, consisting of Hurricane G-AMAU, Hart G-AEMR and Tomtit G-AFTA. Individual demonstrations by most of the vintage aircraft present continued the display, interrupted at one stage by the arrival of Prince Cantacuzene's Jungmeister—flying sideways. Demonstrations complete, a delay followed while adjustments were made to the Jungmeister's port engine-cowling and starboard rudder-pedal. Then came a masterly display of aerobatics and inverted flying, finishing with the incredible flick-roll on landing. This closed the flying display—and opened many intense discussions among those who just didn't believe it.

TRAINER, BOMBER, FIGHTER—of the old school. Note the various nose-attitudes as Tomtit, Hart and Hurricane formate at the Vintage Rally, reported above.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

H.M.S. OCEAN—the British light fleet carrier, now performing a tour of duty in Korean waters, with her aircraft ranged for action. A Sea Fury is positioned ready on the accelerator.

Queen's Colour for R.A.A.F.

ON September 17th, at Laverton, Sir William McKell, Governor General of Australia, will present the Royal Australian Air Force with the Queen's Colour. Almost every R.A.A.F. unit will be represented at the consecration and presentation parade.

The Colour incorporates the Southern Cross, the Federation Star and sprigs of wattle. In the centre, in gold, is the late King's cipher, surmounted by a crown. The ground is Air Force blue.

The Colour was awarded to the R.A.A.F. by King George VI, who also approved of its design. Her Majesty the Queen has expressed the wish that this same Colour be taken into service by the R.A.A.F. as the Queen's Colour, and that it retain the original cipher.

Open Day at Ford

THE low ambient temperature did not affect the warmth of the naval welcome aboard H.M.S. *Peregrine* (R.N.A.S. Ford, Sussex) on Saturday last. Friends, relations and visitors—and there were many—found much to interest them; representative naval aircraft (including a Swordfish 3) on view, an excellent display of ground, sea and air equipment, a photographic exhibition—and, of course, the flying display.

This opened with a stream take-off by 12 Attacker F.B.2s of 890 Squadron, and a nicely-judged parachute jump from a Dragonfly helicopter at 1,500ft. by "Dumbo" Willans. The Attackers then flew past in formation, and four of them, led by Lt. Derek Taylor, gave an impressive exhibition of tight-formation aerobatics. After a rocket-assisted take-off demonstration, the first race of the afternoon took place, between six different types of piston-engined aircraft, and was won by Lt. Hoare in a Firefly 6, which had been first away under the handicaps given. Two polished displays of aerobatic flying followed, the first by Lt/Cdr(E) A. Goodhart in an Olympia sailplane, and the second by three Meteor 7s of the Naval Air Fighter School, Culdrose. The "Captains *versus* Commanders" relay race (mentioned in last week's issue) was narrowly won by the Captains.

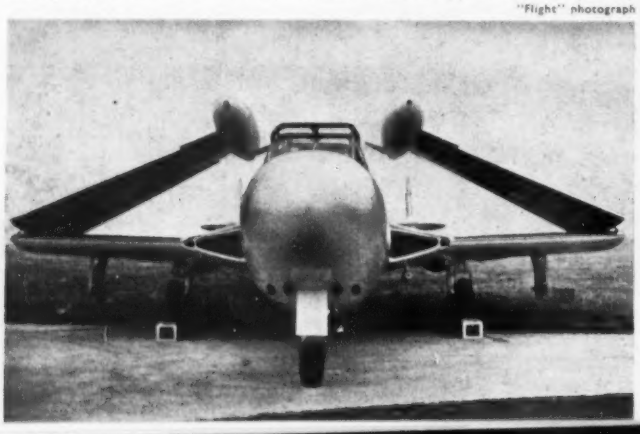
Lt. H. Phillips in the Dragonfly then rescued an anonymous leading airman from a dinghy, and deposited him, minus trousers, on top of the tower. As a finale, Ford's own squadrons (3 R.N. and 1 R.N.V.R.), together with the three visiting R.N.V.R. squadrons, made a successful mock attack on the airfield, Lt/Cdr. R. W. Kearsley (C.O. of 890 Squadron) performed individual Attacker aerobatics, and a mass formation fly-past of all squadrons present rounded off the occasion.

Canberra for Woomera

AN R.A.A.F. pilot and navigator, F/L. J. A. Macleod and F/O. R. J. Atkinson, are on the way to England to collect a Ministry of Supply Canberra for use on the rocket range at Woomera.

CONCENTRATED VENOM: One of the first pictures of a de Havilland Sea Venom N.F.20 with tip-tanked wings in the folded position—as seen in the Static Park at Farnborough. This two-seat night fighter will soon come into service with carrier-borne squadrons of the Royal Navy.

"Flight" photograph



R.A.F. Appointments

THE Air Ministry has announced that A.V-M. R. L. Ragg, C.B., C.B.E., A.F.C., is to be A.O.C. No. 18 Group, Coastal Command, and Senior Air Force Officer Scotland. His appointment as Director-General of Personnel (II), at the Air Ministry will be taken over by A.V-M. G. R. Beamish, C.B., C.B.E., who has recently returned from a spell of overseas duty as A.O.C. Iraq.

Following the announcement that A. Cdre. J. G. Franks would take over command of No. 24 Group comes the appointment of A. Cdre. H. D. Spreckley, C.B., O.B.E. to take his place as A.O.C. and Commandant of R.A.F. Technical College, Henlow, Bedfordshire.

Three other appointments for air commodores are announced. A. Cdre. G. B. M. Rhind, at present Director of Servicing, Research and Development at the Ministry of Supply, will become Senior Technical Staff Officer, 2nd Tactical Air Force, Germany, in September, and will be succeeded at the Ministry of Supply by A. Cdre. W. A. Opie, C.B.E., who until recently was in command of the R.A.F. Base at Seletar, Singapore.

A. Cdre. L. R. S. Freestone, O.B.E., the present Senior Technical Staff Officer at H.Q., 2nd T.A.F., is to become Director of Armament Engineering at the Air Ministry in October.

Two Naval Appointments

THE Vice-Controller (Air) and Chief of Naval Air Equipment since February, 1950, Vice Admiral E.M.C. Abel Smith, C.B., C.V.O., has been appointed to be Flag Officer, Royal Yachts.

Admiral Abel Smith is a qualified air pilot and much of his service has been carriers. When war broke out, he was Commander (Flying) in H.M.S. *Courageous*. Later in October, 1939, he was appointed to the command of a Fleet Air

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After two years' experience of these aircraft on high-density routes the Assistant General Manager, Mr. J. W. Veale sent us this appreciation of the highly satisfactory service which the Short Solent flying boats have afforded to Tasman Empire Airways Ltd. of New Zealand.

THE CUMBERBATCH TROPHY which is awarded annually by the Guild of Airpilots and Navigators to the airline company making the most outstanding contribution to air safety, has this year been won by Tasman Empire Airways Limited. For over twelve years T.E.A.L. have operated Short flying boats with complete success.

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P 23

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SERVICE AVIATION . . .

Arm Fighter School. In 1943 he commanded the escort carrier *Biter*, which played an important part in Atlantic anti-submarine operations.

In 1944, Admiral Abel Smith became Naval and Naval Air Attaché at the British Embassy, Washington. He became Flag Captain and Chief Staff Officer to the Flag Officer (Air) and Second-in-Command, Mediterranean Station in 1948 and during that appointment commanded H.M.S. *Triumph*.

In January of next year Vice-Admiral J. A. S. Eccles will take up his new appointment as Flag Officer Air (Home). He, also, has considerable carrier experience. In 1943, he took command of H.M.S. *Indomitable* and remained with this ship until December 1945, having served during this period in her as Flag Captain to the Rear-Admiral Aircraft Carriers, Eastern Fleet, and Flag Captain to the Flag Officer Commanding the 11th Aircraft Carrier Squadron in the Far East. He was mentioned in despatches for gallantry and skill during operations performed in collaboration with the U.S. Fleet in the capture of Okinawa, and received his C.B.E. for services in the Far East during an attack on enemy oil installations at Palembang.

Malaya Honours List

THE following awards to officers and airmen were published in the *London Gazette* for August 29th, 1952. They are given for services during the period December 1st, 1951, to May 31st, 1952:—

Second Bar to the Distinguished Flying Cross.—S/L. W. G. G. D. Smith, D.S.O. and Bar, D.F.C. and Bar.

Distinguished Flying Cross.—S/L. A. P. Norman, F/L. W. Banks, F/L. K. W. Johnson.

Distinguished Flying Medal.—Sgt. A. Limbert.

O.B.E.—W/C. E. J. Andrews.

M.B.E.—F/L. A. P. Stevens, Act. S/L. L. H. Winter.

MODERN SIR GALAHAD: Air trips in Vampire N.F.10 night fighters were a feature of the summer camp of No. 3618 (County of Sussex) Fighter Control Unit at West Malling, Kent. F/O. A. Wright lends his passenger, A/C.W. Wallace, a hand in arranging some rather unfamiliar millinery.

AT LYNEHAM: Moving R.A.F. Regiment "casualties" by Valetta during last week's big casualty air-evacuation exercise, code-named "Cast Anchor."

B.E.M.—F/S. D. Reynolds, F/S. P. Laidler, Sgt. E. Simpson.

Mentioned in Despatches.—Act. S/Ls. W. Stringer, and P. G. Whitby. F/Ls. J. R. Dowling, T. Enright, P. Hyden, A. J. Lee, C. J. Meyers, V. J. C. Miles, D.F.C., G. N. Sims, D.F.C., and G. J. Smith; W/O. T. B. Whittaker; M. Sig. A. K. Summerson; F/Ss. A. Bourne and T. J. Long; Sgts. D. S. S. Adams, G. F. Anstey, C. R. Everingham, J. H. Lawrence, G. Wilson and E. M. Wyke; S/Tech. F. C. Mathers; Cpls. W. J. Lecombet, M.b. Othman, D. D. Nesbitt, H. V. Parish, J. N. Stonehouse and K. Towers; S.A/C M. E. Chester; L.A/Cs T. B. Hannington, O. J. Turner and Y.b. Othman.

Flying Scholarships

A FURTHER 19 members of the A.T.C. and Combined Cadet Force (R.A.F. section) have been awarded Air Ministry flying scholarships, each worth £150. The cadets will be trained to "A" licence standard.

The cadets and the clubs at which they will be trained are: Plymouth and District Aero Club, F/Ss. J. V. Hunter and F. F Clarkson, Cpl. Dean and L.Cdts. A. R. Mills and D. Britton; Portsmouth Aero Club, Sgt. L. B. Binnie and J. A. Walmsley and Cdt. D. W. Gates; Hampshire Aero Club, F/S. D. J. Summers, Sgt. E. E. Jones and L.Cdt. D. Marlow; West London Aero Club, F/S. P. Edgson; Goodhew Aviation Co., Cpl. J. L. Bowman; Exeter Aero Club, Drum Major R. Langworthy; Bristol and Wessex Aeroplane Club, F/S. A. C. Perryman, Sgts. G. T. Murray and M. Griffin; Airways Aero Club, F/S. A. F. Burgess and Sgt. J. P. Hellings.

Over 30 flying clubs have so far received Air Ministry contracts for cadet training.

Helicopter Casualty Evacuation

IN the two years during which the Far East Air Force Casualty Evacuation Flight has operated its helicopters, over 200 sick and wounded have been lifted from jungle clearings and placed within easy reach of hospital.

The method of evacuating a casualty has now become almost standardized. As soon as H. Q., Malaya District, learns that a man is in need of medical attention, an Auster of an A.O.P. Flight and a helicopter are alerted. While the helicopter stands by to await events, the Auster sets out to locate the patrol which has the casualty. Once the patrol has been discovered, the pilot of the Auster gets in touch on the R/T with the patrol commander, who gives him his map-reference position. The pilot then flies round the area looking for a clearing or other piece of ground which can be made suitable for a helicopter landing.

On his return the pilot again gets in touch with the patrol commander and advises him of the distance, bearing and estimated marching time to the clearing. It is then for the patrol commander to decide whether a helicopter can best be used or whether it would be quicker to march out of the jungle carrying the casualty.

If a decision is made to use the helicopter, the pilot watches the progress of the patrol to the clearing and advises on the measures necessary for the preparation of the landing patch. When he is satisfied that all is ready for its reception he flies back to the helicopter, which by now has come up to a forward position. He accompanies the helicopter to the clearing and finally escorts it to its next alighting place before returning to base.

Instead of a stretcher, each helicopter carries a shallow wicker basket, 6ft long, designed by the Flight and made locally. It contains a Sorbo rubber mattress and has special attatchments to prevent movement during the flight.

Reunion

THE fifth reunion dinner of No. 202 Squadron, R.A.F. will be held in London on Saturday, October 18th, 1952. Further information may be obtained from F/L. Tommy Snasdell, BM/Catalina, London, W.C.1.

The Old Comrades Association of No. 208 Squadron (Naval 8) is holding its 1952 reunion at the Swiss Hotel, 53, Old Compton Street, London, W.1, on Saturday, October 25th. Intending participants are asked to inform F/L. C. Bradley, 21, Melbury Gardens, London, S.W.20.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

"Passing of the Tiger"

I HAVE read M.N.M.'s article on the "Passing of the Tiger" (August 22nd), and although I, like many others, am prepared to take his views all in good part, there nevertheless remains a certain feeling of sadness within me, only eased by the very beautiful accompanying photographs.

Let me hasten to explain this certain "feeling within." The Tiger has, no doubt, been responsible for the basic training of perhaps more British pilots in all spheres of the art than any other trainer. Furthermore, its high degree of safety in the hands of both novice or expert has been a well-known and cherished factor in most circles of training.

All this, surely, places the faithful old aircraft in a warm place in the hearts of thousands of those who first took the air within her slender cockpit. But from my own point of view, it is only the shapely well-balanced appearance of the Tiger that will always bring back boy-like memories of my first love of aeroplanes.

That love of the air has grown more and more as the years have passed by, and now I am at a stage when, purse willing, I have a strong desire to join a flying club, with a P.P.L. as the chief aim. Hence my concern when I read M.N.M.'s remarks regarding the "recruit"—"if he does not show himself willing to endure suffering for suffering's sake, then he had much better stick to the safe, if irksome, security of his office stool."

The author might well have been speaking directly to me, for so well does this phrase apply, except that I use a chair! But seriously, I would appreciate it if some kind instructor of a flying club would dispel by a few words some of these fears about the private side of training, whether in a Tiger or any other type which the clubs use. One reads so little nowadays about this side of aviation, or at any rate in this country.

In the meantime, "Long live the Tiger," even if only as a pretty vintage display-piece.

Hitchin. ERIC B. WILLIAMS.

The Drift Overseas

AS a technical author, my job brings me into close contact with a representative section of the aircraft industry, from the designers "on the boards" to the mechanics at their benches, and I know from first-hand experience how much discussed is this subject of emigration. Therefore, I feel that I must mention some of the more human aspects of the "drift overseas." The opinions expressed in the five examples given below are not, incidentally, my own, but I have selected these examples because they collectively express a long-held opinion of mine. It is: If you want to improve a system, first study the men behind it.

(1) I asked a section-leader who had spent 15 years in the aircraft industry why he was leaving for Canada. He had come round to shake hands and I might add that besides having letters after his name he was a most mild-mannered man. "I am taking the plunge," he replied, "because I was initially wrong in assuming that aeronautical engineering is the peak of perfection in engineering. That's why I transferred from shipbuilding 15 years ago. Now I am fed up with flannel and favouritism. It isn't what you know but who you know that counts. I am fed up with 'carrying' people."

(2) The other day an inspector on a production line came up to me and said, "Have you heard, I'm off to Canada?" Then he added, almost apologetically, "It's not that I am ambitious, it's my wife and the two kids. We've been living in rooms for years waiting for a miserable little prefab on a ruddy great housing estate. My brother-in-law went to Canada and got a house and a car within a year. My wife has to share a kitchen, you see. Here is a photograph of her sister's kitchen."

(3) I met an old school friend of mine, now a technical sales representative, and he too was off to Canada. "Why?" he echoed my question. "I'll tell you why. They are really scared stiff of original ideas in this country. The national economy is so nicely balanced on a razor's edge that everyone is scared to make a move. They don't mind you doing as little as you can get away with, but woe betide you if you show any initiative." When asked who "they" were, he replied, "*You* should know."

(4) A servicing engineer, who goes all over the country, is off to Canada. "I can't stick much more of this," he explained. "In the old days you could go up to anyone in the industry, ask a question and get a reply, decent or otherwise—but you did get a reply. Nowadays, you never seem to get beyond some beautiful but bored b—— of a secretary in some outer office. Last week I had to visit a London firm and no sooner had I stopped my car in their car park than a dozen works police pounced on me. You know what I had done? I had parked where the chief designer usually parks. Later it come out he was away on holiday, but that did not make any difference. I had to move."

(5) A young draughtsman, whose brother went to Canada, and is considering joining him, told me this story. "Guess what, X condescended to talk to me today on the way to lunch. I was quite embarrassed. In order to make conversation I nodded towards the rows of post-war cars in the executive car park and said I'd like to have my pick. He put a fatherly hand on my shoulder and said, 'Young fellow, let me give you a word of advice. Don't get ambitious. You have no idea how unhappy life can be for an ambitious man.' Unfortunately, his sermon on the tarmac was spoilt by his departure through the impressive portals of the executive staff canteen."

Whether Canada will prove a remedy for all these ills is another question, but my five friends were sure of it. I fancy that in a few years' time five aeronautical engineers in Canada will be making similar complaints, and I base this assumption on my final example, a personal experience. I was once accorded the privilege of talking to a normally inaccessible personnel manager. During the course of our conversation, I happened to refer to someone as "a decent working-class chap." At this he raised one eyebrow and repeated my phrase as if it did not quite make sense; yet he, too, had started his industrial life at a lathe.

Gloucestershire. W. D. PEREIRA.

An Appeal in Remembrance

From Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.

AS September comes round our thoughts must turn again to that September of twelve years ago, when the courage and determination of our young fighter pilots beat the Luftwaffe out of our skies and caused Hitler to postpone and eventually to abandon his plans for the invasion of this country.

In memory of those gallant men and in thanksgiving for their victory, Battle of Britain Week is held each year at the time when that great decisive battle was at its peak. It is then, especially, that we have an opportunity to recall all that their sacrifice and devotion has meant to the people of Britain and the free world.

Each September, events of many kinds are organized in cities, towns and villages throughout Great Britain by branches of the Royal Air Forces Association. This year, in addition to the usual activities, the Association will be holding, on Saturday, September 20th, its second national Wings Day appeal in an attempt to meet the increasingly heavy expenses incurred in providing welfare services for former airmen and airwomen of the Royal Air Forces in all parts of the world.

Some 600 branches in all parts of Britain and in many places overseas will be taking part in this national effort on behalf of those connected with the Air Forces who may find themselves in need.

The motto for Wings Day is "Give for those who gave."

I am grateful for the opportunity of appealing through your valuable columns to the public to give as much as they can afford to help a cause which, at this time of the year particularly, should be very much in our minds.

R. SAUNDBY,
London, W.1. Air Marshal (Retired)
(Chairman, National Council, R.A.F.A.).

FORTHCOMING EVENTS

Sept.	13.	Royal Air Forces Association: Display, Stansted Airport, Essex.
Sept.	13.	Southern Aero Club: Rally, Shoreham.
Sept.	14.	Milan Aero Club: Milan Grand Prix.
Sept.	15.	Battle of Britain Day.
Sept.	15.	I.A.T.A.: Eighth Annual General Meeting, Geneva.
Sept.	17.	Aircraft Recognition Society: Opening 1952-53 Meeting and Contests.
Sept.	17.	Golf: R.N. and W.R.N.S. v R.A.F. and W.R.A.F., Camberley.
Sept.	20.	R.A.F. At Home Day.
Sept.	20.	British Interplanetary Society: Report by British Delegation on Stuttgart Congress.
Sept.	20.	Derby Aero Club and R.A.F.V.R.: "At Home."
Sept.	21.	S.M.A.E.: Models Contests, Butlin's Holiday Camps.
Sept. 24-25.		Aerodrome Owners' Association: Annual Conference, London.
Sept.	28.	Aéro-Club de France: Coupe Stamm Helicopter Competition.
Oct.	3.	Helicopter Association: Brains Trust (Question Master, N. E. Rowe, C.B.E., F.R.Ae.S.).
Oct.	15.	Aircraft Recognition Society: Second 1952-3 Meeting and Contests.
Nov.	8.	British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Nov.	7.	Helicopter Association: "Operational Future of the Helicopter," by P. G. Masefield, M.A.(Eng.), F.R.Ae.S.
Dec.	13.	British Interplanetary Society: "Guidance and Control of Missiles," by J. Humphries, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S.

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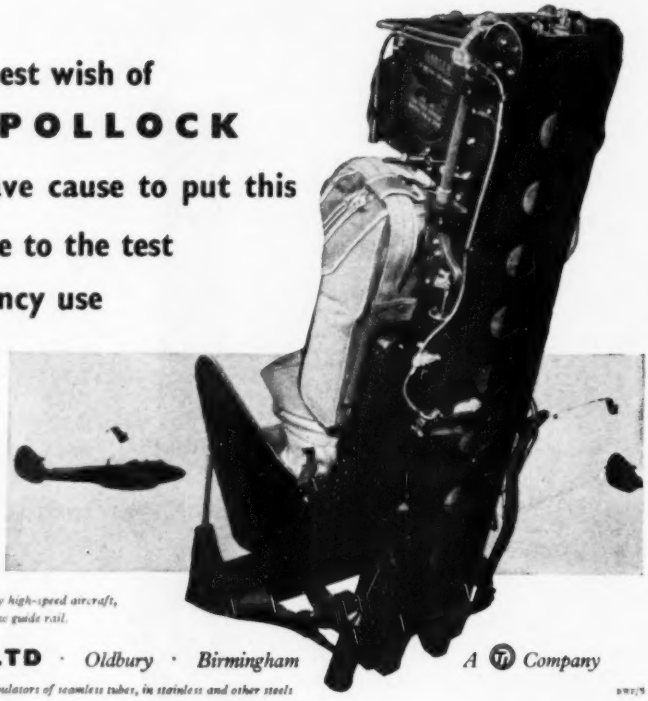

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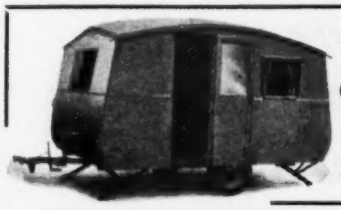

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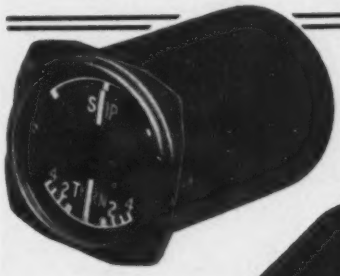

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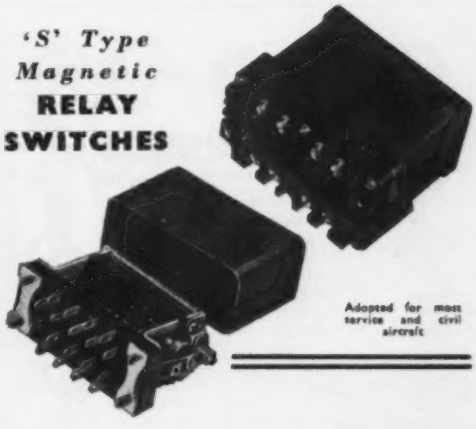

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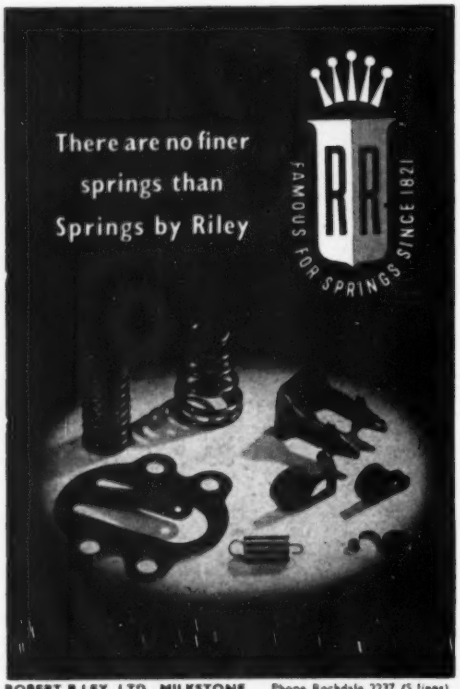

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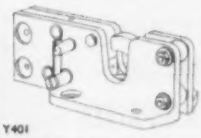

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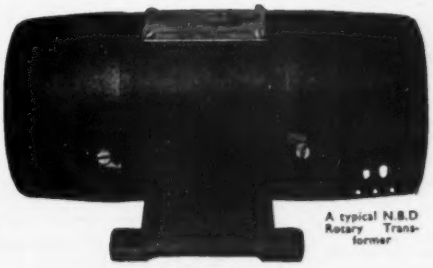

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PUBLIC ANNOUNCEMENT

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THE Air Transport Advisory Council give notice that they have received from Morton Air Services, Ltd., of Croydon Airport, Surrey, an application for a licence to operate with D.H. Dove, Consul or D.H. 89 aircraft, an internal air service for the carriage of passengers, supplementary freight and mail between Bristol (Whitchurch) and Jersey with an intermediate traffic stop at Guernsey. The frequency proposed for this service is 6 to 28 services weekly, to be operated during the period from January 1st, 1953 to December 31st, 1959. This application will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to this application must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the application may be obtained. [0653

THE MINISTRY OF CIVIL AVIATION invites offers from British firms for the purchase of 11 Tudor aircraft, suitable for ferrying freight.

ARRANGEMENTS for viewing the aircraft can be made on application to the Ministry of Civil Aviation, FA4, Ariel House, Theobald's Road, London, W.C.1, to whom all inquiries should be addressed. [0654

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

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(for aircraft detail work in design office)
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APPLY in writing, to the Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. [0844

LICENSED radio engineer required. Also engine and aircraft fitters. Apply :—
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LUTON, BEDS. [0842

ROLLS-ROYCE, Ltd., Hucknall Aerodrome, Notts, have vacancy for stressman of degree standard or with H.N.C. in aero subjects.
APPLY by letter to Personnel Manager, stating age, experience and qualifications.

FOLLAND AIRCRAFT, Ltd. require a senior weights engineer for an interesting programme of aircraft work. Apply to the Personnel Manager, Folland Aircraft, Ltd., Hamble, Hants. [0600

THE ENGLISH ELECTRIC Co., Ltd., Aircraft Division, A. Warton Aerodrome (nr. Blackpool) invite applications for the following posts in the experimental flight testing group :—

1. Senior Engineer with experience in stability and control problems. Applicants should possess an honours degree and have at least three years' experience in aeronautics. Flying experience would be an advantage. (Ref. 635).

2. Engineer experienced, or interested, in flight observing duties. Preference will be given to applicants possessing a degree or H.N.C. in aerodynamics (Ref. 1041).

3. Instrument engineer/mechanic with experience in maintaining and calibrating aircraft instruments. It is desirable that applicants should possess some technical qualification. (Ref. 1014).

SALARY will be commensurate with experience and qualifications. Please write, giving full details and quoting appropriate reference to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London, S.W.1. [0853

REQUIRED by Air Charter Company in Nairobi: licensed engineer "C" licence essential, willing to obtain "D" licence.—Write fullest details to Adio Aviation, Ltd., Croydon Airport, CRO 2828. [0646

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BRITISH INTERNATIONAL AIR LINES, Ltd., Kuwait, invite applications from single licensed radio engineers, or those prepared to accept separation from their families, preferably with experience on Dakota aircraft radio installations.

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A LEADING firm of aircraft component manufacturers in the south-west requires the services of a senior development engineer able to direct and co-ordinate an intensive programme of development work on aircraft equipment of the highest importance.

APPLICANTS who should preferably hold a university degree, must show evidence of some years' experience on similar work and should be accustomed to working in close collaboration with Government departments.

APPLICATIONS will be treated in confidence and should give full particulars of qualifications, experience, and salary required.—Box 2499. [0041

HELLIWELLS, Ltd., The Airport, Walsall, are in urgent need of aircraft draughtsmen for interesting development programme. Pleasant conditions and attractive rates of pay for the right men.—Apply, giving details of age and experience, to Personnel Manager. [0060

SENIOR technical assistant (mechanical) required for vibration research. Interesting work, five-day week. —Please write, stating age and previous experience to the Personnel Officer, the de Havilland Engine Co., Ltd., Red Lane, Edgware, Middlesex. [0053

TWO experienced weights engineers required with minimum qualifications of Ordinary National Certificate. Apply Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge Works, Weybridge, Surrey. [0046

TECHNICAL illustrator required, aged 23 or over, with considerable practical experience.—Applications, in writing, to Personnel Manager, Percival Aircraft, Ltd., Luton Airport, Beds., stating age, experience and salary required. [0063

BRITISH MESSIER, Ltd., Cheltenham Road East, Gloucester, require a senior weights engineer to run small weight section.—Please write, stating age, experience and salary required to Mr. E. G. Collinson, Chief Technician. [0016

AND B. licensed engineer required for appointment in Rhodesia. The position, which calls for endorsement on Dove, Dakota and Viking aircraft, will be on a contract basis. Applicants, preferably single, are invited to submit full details, in confidence, to Box 2358. [0019

ENGINEER required for service in Amman, Jordan. Requirements: A. and C. licence with Rapide and Consul endorsements. Pay £120 per month.—Apply: P. and M. Aero Services, Ltd., 355 Watford Road, St. Albans (Tel.: 6107). [0035

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STRESSMEN, senior and junior, required for interesting work in connection with aircraft undercarriage and hydraulic equipment.—Write, stating age, experience, qualifications and salary required, to Mr. E. G. Collinson, Chief Technician, British Messier, Ltd., Cheltenham Road East, Gloucester. [0015

TECHNICAL author required in rapidly growing department for the preparation of aeroplane landing gear and hydraulic equipment publications. Knowledge of M.o.S. procedure desirable but not essential.—Apply personally to Mr. J. R. Smith, British Messier, Ltd., Cheltenham Road East, Gloucester. [0056

IMPORTANT Midlands gas-turbine aircraft-engine manufacturer has vacancies for a number of designers and senior and junior draughtsmen. Although experience is most advantageous, it is not necessarily essential as training will be given.—Apply in some detail, please, to Reference F101, Box 0993. [0016

WEIGHT estimators, senior and intermediate, required by Percival Aircraft, Ltd., Luton Airport, Beds, for work on fixed wing and helicopter aircraft. Good welfare facilities, including staff pension scheme.—Apply, giving details of age, qualifications, experience and salary required, to Personnel Manager. [0062

H. M. ROBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic fixing controls for aircraft.—Robson Works, Fordhouses, Wolverhampton. [0020

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities, including staff pension scheme.—Applications, stating qualifications, experience, age and salary required, to Personnel Manager. [0066

DESIGNER draughtsman required, experienced in light precision hydraulic mechanisms and metering devices or similar equipment. Applicants should be up to H.N.C. or equivalent standard.—Please reply, stating experience qualifications, age and salary required, quoting reference PM/Drill to Personnel Manager, Joseph Lucas Ltd., Great King Street, Birmingham. [0055

LANCASHIRE AIRCRAFT CORPORATION, Ltd., (Skyways of London) have vacancies at Stansted Airport for all categories of ground staff and at Bovingdon Airport for radio mechanics, instrument mechanics, aircraft electricians and inspectors.—Applicants may apply in person to the airport or in writing to the Personnel Manager at 11, Berkeley Street, London, W.1. [0031

BRITISH EUROPEAN AIRWAYS have vacancies for planner-ratefixers at Renfrew, to cover the following departments: (1) manufacture of components and sub assemblies in the Detail Shop; (2) aircraft repair and maintenance. Applicants should preferably have served a five years' apprenticeship in engineering and have had several years' experience in planning and ratefixing in either of the above shops. Salary scale £11 4s. by 7s. 6d. to £13 1s. 6d. per week.—Applications in writing to Base Personnel Officer, British European Airways, Airport for Glasgow, Renfrew. [0036

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APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of servo-engine design desirable, but not essential. Also checkers. —Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0600]

HANDLEY PAGE (READING), LTD., The Aerodrome, Woodley, Reading, have vacancies in their design office for senior and intermediate airframe draughtsmen, a senior electrical draughtsman and senior and intermediate aerodynamicists of degree standard or with H.N.C. in aero subjects.—Please send full particulars to the Personnel Officer. [0574]

CHRISTCHURCH, Hants. Applications are invited from experienced technical authors, technical illustrators and spares compilers required for the preparation of Ministry of Supply and Civil Manuals, repair schemes, etc.—Applications to Personnel Manager, The de Havilland Aircraft Co., Ltd., Airspeed Division, Christchurch, Hants. [0623]

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen, for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager [0595]

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines.—Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0632]

TECHNICAL assistants required in the Experimental Department. Sound engineering background essential preferably with experience on gas turbine, i.c. engine and component rig testing, capable of writing a comprehensive report on condition of engines, etc., after test.—Please write, stating age, training experience and salary required to The Personnel Officer, The de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [0636]

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CHRISTCHURCH, Hants. A vacancy exists for a position as an assistant designer on a new and interesting project. Candidates must have had at least seven years' drawing office experience in the design of main structural components of aircraft, and must possess initiative in dealing with new problems and original development work. A practical knowledge of fundamental stressing and of structural testing is most desirable. The position offered is a responsible one with good prospects, involving the control of a D.O. Section employed on prototype work. An attractive salary will be given to the right person.—Applications should be adressed to Chief Designer, The de Havilland Aircraft Co., Ltd., Airspeed Division, Christchurch, Hants. [0594]

MINISTRY OF SUPPLY require aeronautical engineers for the grade of experimental officer at London Headquarters. Duties consist of writing technical notes for pilots on individual aircraft accepted for service with the Royal Navy and R.A.F. A general knowledge of aircraft engines and airframes is essential with ability to keep abreast of modern developments on aircraft. Operational experience as a pilot during the last war, or some all-weather flying experience, would be an advantage. Candidates should have a Higher School Certificate with a science subject as a principal subject, but possession of a degree, H.N.C. or equivalent qualification in aero engineering an advantage. Salary according to qualifications and experience within the inclusive range: £628–£796 p.a., male (minimum age normally 26). Salaries for women somewhat lower. Post is unestablished. Application forms from Ministry of Labour and National Service, Technical and Scientific Register (K), Almack House, 26, King Street, London, S.W.1, quoting C.S/7/52A. [0627]

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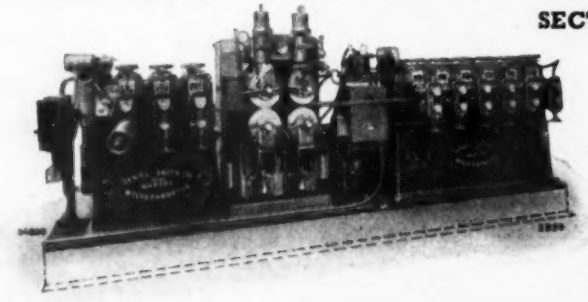

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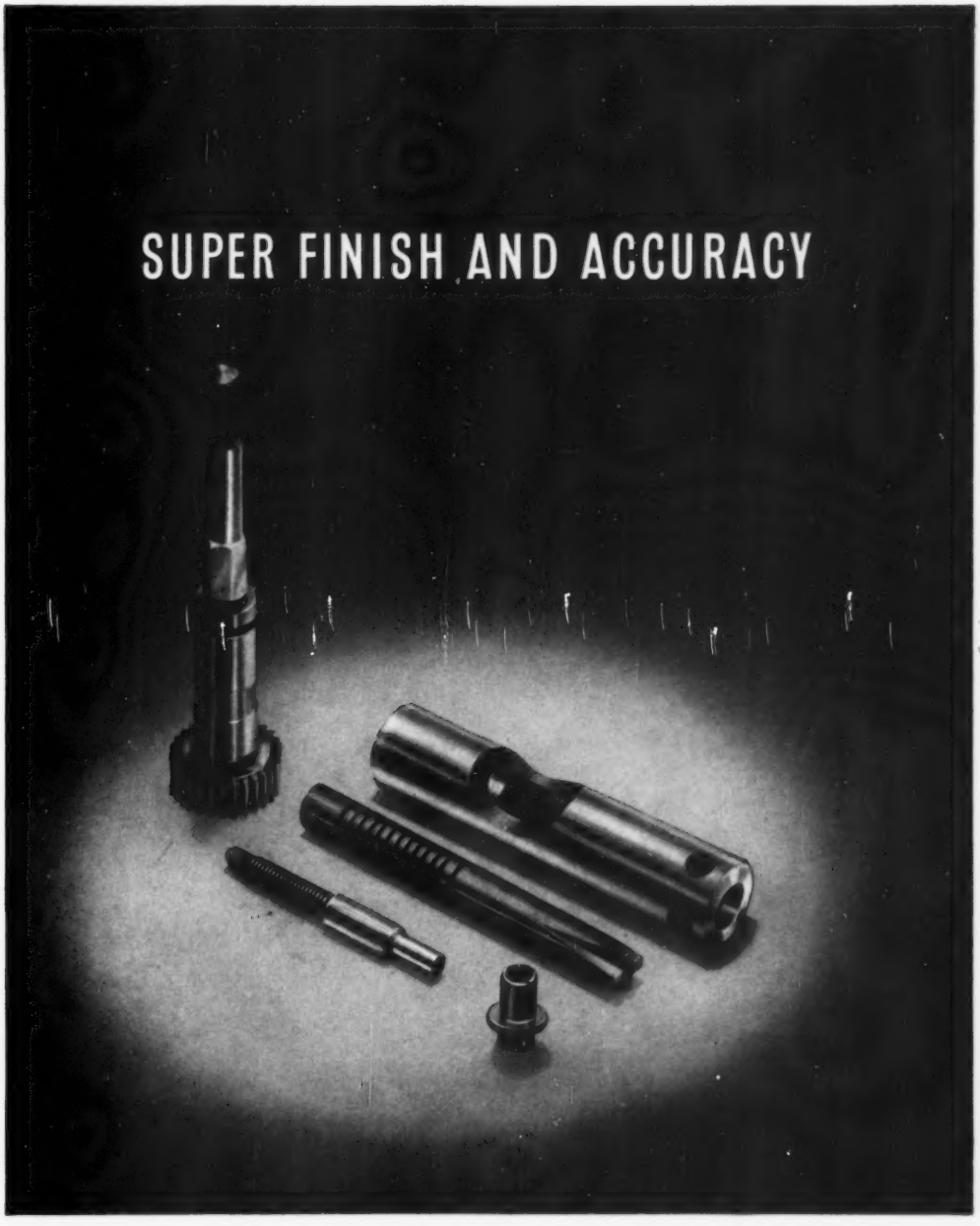

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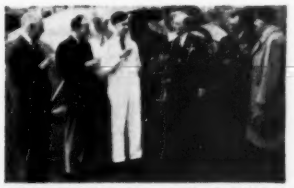
"BRISTOL" SYCAMORE TOURS SEVEN COUNTRIES IN 18 DAYS...

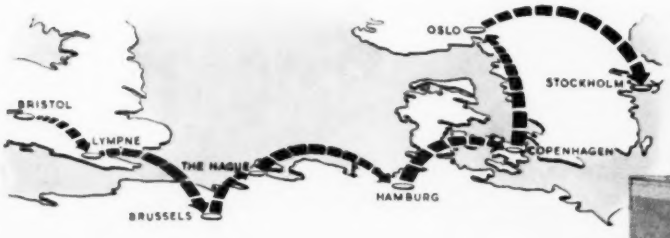
Stowed in the hold of a Silver City Freighter which had carried it from Stockholm, the Type 171 "Bristol" Sycamore which left Filton on May 11th for a sales demonstration tour of the Low Countries and Scandinavia, returned to Filton on Thursday, May 29th. During the Filton-Stockholm journey the aircraft had flown for 33 hours, covered 1,400 miles, and carried — appropriately — a grand total of exactly 171 passengers during demonstration flights.



BRISTOL. *Champagne send-off at Clifton College.*

BRUSSELS. *Landing at l'Arcade du Palais du Cinquantenaire. ("Le Soir" of Brussels photo).*

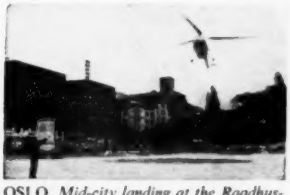
THE HAGUE. *Spectators at Ypenburg watch a crew member climbing up to the Sycamore*



HAMBURG. *About to take off from Heilingengeistfield for Fuhlsbuttel Airfield.*

COPENHAGEN. *Up the rope ladder again — another demonstration by a crew member.*

HOME AGAIN. *The Sycamore is unloaded from a Silver City Freighter at Filton.*



OSLO. *Mid-city landing at the Raadhus-place.*

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